

FEAS OF VENEZUELA

by

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and

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ABSTRACT

Forty-three species of fleas were collected in Venezuela by personnel of the Smithsonian Venezuelan Project. Currently there are fifty-two species of fleas known from Venezuela. Four new taxa are described: *Hormopsylla cryptica*, *Ctenidiosomus perplexus*, *Adoratopsylla antiquorum rara* and *Adoratopsylla antiquorum recta*. The females of *Adoratopsylla antiquorum discreta* Jordan and *Rothschildopsylla noctilionis* (Costa Lima) are described. The families Steph-

anocircidae (*Cleopsylla*, *Craneopsylla*, *Plocopsylla*, *Sphinctopsylla*) and Pygiopsyllidae (*Ctenidiosomus*) are reported from Venezuela for the first time. Two male specimens of the genus *Orchopeas* constitute the first record of this genus in South America and records of species of the genus *Pleochaetis* are the first reported for Venezuela. Illustrations are provided to facilitate identification of Venezuelan fleas.

INTRODUCTION

Venezuela, a country of great fascination to zoologists, is geographically located so that elements of the Amazonian, Andean, and Middle American faunas are represented. The rhopalopsyllid genera *Rhopalopsyllus* Baker and *Polygenis* Jordan and the hystrichopsyllid genus *Adoratopsylla* Ewing are characteristic of the Amazonian flea fauna. The Andean flea fauna, virtually unknown heretofore in Venezuela, is represented by the stephanocircid genera *Cleopsylla* Rothschild, *Craneopsylla* Rothschild, *Plocopsylla* Jordan and *Sphinctopsylla* Jordan, the pygiopsyllid genus *Ctenidiosomus* Jordan and the hystrichopsyllid genus *Neotyphloceras* Rothschild. The Middle American fauna, also poorly known in Venezuela, is contained primarily in two ceratophyllid genera, *Pleochaetis* Jordan and *Orchopeas* Jordan.

Papers published to date have dealt principally with the Amazonian flea fauna in Venezuela. Anduze, et al. (1947) listed 21 species and subspecies, and the list was subsequently enlarged to include 29 species and subspecies by Cova Garcia and Tallaferrero (1959). Machado-Allison (1966) recorded 30 species and subspecies, and his list is essentially the same as

that provided by Barrera and Diaz-Ungria (1957).

During a three year period from July 1965 to September 1968, approximately forty thousand mammals were collected in Venezuela by personnel associated with the Smithsonian Venezuelan Project (SVP), who had the support and cooperation of several individuals and agencies in Venezuela. Most of the mammals were examined for ectoparasites. This paper is based on 43 species and subspecies of fleas collected from the host animals by SVP. With species previously listed but not collected by SVP the number of species and subspecies known from Venezuela is raised to 52. However, a definitive study of the fleas of Venezuela still is not feasible even though the SVP collection is rather extensive both geographically and ecologically. Several genera, particularly *Polygenis* Jordan and *Pleochaetis* Jordan are badly in need of revision. Specific names assigned to some populations in these genera are provisional at best. Large series of specimens from type localities will be required before species can be defined and the limits of subspecific variation determined.

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In addition to reporting species in four genera of the family Stephanocircidae and a species of *Ctenidiosomus* in the family Pygiopsyllidae from Venezuela for the first time, we also report the initial finding of a species of the genus *Orchopeas* in South America. We have described two new species, two new subspecies, and the females of *Adoratopsylla antiquorum discreta* Jordan and *Rothschildopsylla noctilionis* (Costa Lima).

We express appreciation to Dr. Robert Traub for his assistance in dealing with taxonomic problems in the genus *Pleochaetis*. Mr. F.C.A.M. Smit studied several populations in the genus *Polygenis* and rendered opinions which were helpful. He looked at specimens in other genera as well, and we are most grateful

for his help. Thanks are due to Dr. Charles O. Handley, Jr., for identification of the host animals. Jeanne Thomas, Michael W. Hastriter, Lynden P. Baum, Peggy Card, and Toni Mariette have been most helpful in the preparation of the manuscript. Lt. Colonel Alexander A. Hubert and the group of artists at the 406th Medical Laboratory, Japan, have been most generous with their assistance; all of the illustrations were prepared by this exceptional group of artists.

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FLEA SPECIES IN THE SMITHSONIAN VENEZUELAN COLLECTIONS

Family Pulicidae

Genus *Pulex* Linnaeus

Pulex Linnaeus, 1758:614.

Type Species: *Pulex irritans* Linnaeus, 1758.

Pulex irritans Linnaeus

Pulex irritans Linnaeus, 1758:614.—Vogelsang, 1939:168-172. — Hecht, 1943:1159-1162. — Anduze and Vogelsang, 1949:1-4.—Hopkins and Rothschild, 1953:105-118. — Johnson, 1957:231, Pl. 106, 107.—Barrera and Diaz-Ungria, 1957:166.—Machado-Allison, 1963:275.—1966:24.

REMARKS

We did not collect *P. irritans* in Venezuela. Records published by Hopkins and Rothschild (1953) ex *Tamandua* sp. and Barrera and Diaz-Ungria (1957) ex *Cerdocyon thous* likely represent the same species we have identified as *P. simulans*. (For further discussion see *P. simulans*).

Pulex simulans Baker

Pulex simulans Baker, 1895:65, 67.—Smit, 1958:523-526, Fig. 1.—Tipton and Mendez, 1966:293, Pl. 48, Fig. 4, Pl. 51, Fig. 6, 7.—1968:178-179.

Type Data: At least 1 male and 2 females ex *Didelphis marsupialis* (= *D. virginiana*), probably Devil's River, Texas, F. M. Webster collector. Smit (1958) has designated

a syntype in the Tring collection as lectotype inasmuch as the male type specimen has been lost.

Other Recorded Distribution: USA: ex *Didelphis marsupialis* (= *D. virginiana*) and *Cynomys mexicanus*. Mexico: ex *Cynomys mexicanus*. Panama: ex *Homo sapiens*.

VENEZUELAN RECORDS (114 males and 193 females)

Seventy-six males and 126 females ex 14 *Tamandua longicaudata* in Falcón, Lara, Monagas, and Carabobo. Other collection records include: 14 males and 27 females ex 10 *Cerdocyon thous* from Trujillo, Monagas, Falcón, and Lara; 7 males and 13 females ex 7 *Conopatus semistriatus* from Monagas and Falcón; 5 males and 3 females ex 3 *Didelphis marsupialis* from Miranda, Monagas, and Lara. Additional hosts include: *Procyon cancrivorus* (Guárico), *Metachirus nudicaudatus* (Barinas), *Galictis vittata* (Monagas), *Proechimys semispinosus* (Lara), *Echimyus semirillosus* (Lara), *Urocyon cinereoargenteus* (Lara), *Zygodontomys brevicauda* (Lara), *Glossophaga soricina*³ (Falcón), and three unidentified hosts.

REMARKS

The aedeagal erochet in our specimens resembles figures given by Smit (1958) but is somewhat more swollen. The dorsal aedeagal sclerite is narrower than that shown by Smit for *P. simulans* and appears to be intermediate between *P. simulans* and *P. irritans*. The median dorsal lobe of the aedeagus is unlike *P. simulans* or *P. irritans*. The apex of the finger of the clasper is truncate, not rounded as in *P. irritans*.

The Venezuelan specimens are very much like material from Cerro Potosi, Mexico, and

³Probably a contamination

Panama. We suspect that the difference between *P. simulans* and *P. irritans* pointed out by Smit (1958) will not stand if long series from several localities are studied.

Fifteen of our 45 collections are from *Tamandua longicaudata* and 202 (65.8%) of the 307 fleas collected were from this host. The flea index on *Tamandua longicaudata* is 13.5 compared with 4.0 on *Cerdocyon thous* and 2.8 on *Conepatus semistriatus*.

Genus *Echidnophaga* Olliff

Echidnophaga Olliff, 1886:171.

Type Species: *Echidnophaga ambulans* Olliff, 1886.

Echidnophaga gallinacea (Westwood)

Sarcopsyllus gallinaceus Westwood, 1875:246.

Echidnophaga gallinaceus, Jordan and Rothschild, 1906:52, Pl. 1, Fig. 1; Pl. 2, Fig. 14; Pl. 3, Fig. 21; Pl. 4, Fig. 27.

Echidnophaga gallinacea, Patton and Evans, 1929:539, Fig. 287.—Hopkins and Rothschild, 1953:88-95, Fig. 93, 109-113; Pl. 14A, 15A, 17B.—Johnson, 1957:232, Pl. 108, 109.—Barrera and Diaz-Ungria, 1957:168.—Machado-Allison, 1963:275.—1966:24.

REMARKS

We did not collect *E. gallinacea* but other workers have recorded it from Venezuela.

Genus *Ctenocephalides* Stiles and Collins

Ctenocephalides Stiles and Collins, 1930:1308.

Type Species: *Pulex canis* Curtis, 1826.

Ctenocephalides canis (Curtis)

Pulex canis Curtis, 1826:114, Fig. A-E, S.

Ctenicephalus canis, Rothschild, 1915:56, 91 Pl. 7, Fig. 4, 10.

Ctenocephalides canis, I. Fox, 1940:26, Pl. 6, Fig. 24, 26, 27.—Hecht, 1942:811-820.—Hopkins and Rothschild, 1953:164-170, Fig. 74A, 154, 156, 158-60; Pl. 5A, 24C, D, 27C.—Johnson, 1957:227-229.—Barrera and Diaz-Ungria, 1957:168.—Machado-Allison, 1963:275.—1966:24.

REMARKS

Although we collected 154 specimens of *C. felis felis* we did not encounter *C. canis*. Bar-

rera and Diaz-Ungria (1957) and Machado-Allison (1963) indicate that this species has been collected in Venezuela.

Ctenocephalides felis felis (Bouche)

Pulex felis Bouche, 1835:505, Fig. 2.

Ctenocephalides felis felis, Hecht, 1942:811-820.—Hopkins and Rothschild, 1953:145, Fig. 14, 152, 155, 157, 161, 162, Pl. 25E, 27A, B, D.—Johnson, 1957:228, Pl. 100, 101.—Barrera and Diaz-Ungria, 1957:161, 163, 170, Lam. II, Fig. 1.—Cova Garcia and Tallafiero, 1959:328, 331, 340, 346.—Machado-Allison, 1963:275.—1966:24.—Tipton and Mendez, 1966:293, Pl. 47.

Type Data: ex "hauskatze"; Germany.

Other Recorded Distribution: *C. felis* is cosmopolitan and has been reported from most countries in South America including: Brazil, Chile, Colombia, Ecuador, Paraguay, Peru, Surinam, and Uruguay. In Venezuela it has been collected from "rat," man, dog, *Rattus rattus* (*R. r. alexandrinus*, *R. r. frugivorus*, *R. r. rattus*), *R. norvegicus*, *Cerdocyon thous* and "*Felis cati dom*" (= *F. catus*).

VENEZUELAN RECORDS (50 males and 104 females)

Most specimens were collected ex 10 *Cerdocyon thous* (18 males and 49 females) in T. F. Amazonas, Trujillo, Apure, Lara and Zulia; ex 13 *Didelphis marsupialis* (13 males and 24 females) in T. F. Amazonas, Lara, Barinas, Monagas, Bolívar, Sucre, Trujillo, and Dto. Federal. Other hosts include: *Zygodontomys brevicauda* (T. F. Amazonas and Sucre), *Sigmodon hispidus* (Carabobo), *Rattus rattus* (Dto. Federal), *Heteromys anomalus* (Dto. Federal), *Agouti paca* (Zulia), *Cyclopes didactylus* (T. F. Amazonas), *Sciurus igniventris* (Bolívar), *Monodelphis brevicaudata* (Carabobo), *Felis pardalis* (Bolívar), *Tapirus terrestris*⁴ (Apure), *Cebus albifrons* (Zulia), *Homo sapiens* (Bolívar, and T. F. Amazonas), and *Carollia perspicillata*² (Falcón).

REMARKS

Of the total 154 specimens of *C. felis felis* collected, 67 (43.5%) were associated with *Cerdocyon thous* (Flea index 6.1) and 34 (22.1%) on *Didelphis marsupialis* (flea index 2.6). Johnson (1957) did not give a subspecific designation for South American populations but our specimens appear to be the nominate subspecies.

Genus *Xenopsylla* Glinkiewicz

Xenopsylla Glinkiewicz, 1907:385.

Type Species: *Xenopsylla pachyruomyjidis* Glinkiewicz, 1907.

⁴Field identification only

Xenopsylla brasiliensis (Baker)

Pulex brasiliensis Baker, 1904:378, 379, 435.

Xenopsylla brasiliensis, Rothschild, 1909:332.—Hecht, 1942:811-820.—Hopkins and Rothschild, 1953:295-300, Fig. 250, 253, 296, 348, 360, 361; Pl. 42B, D, F.—Johnson, 1957:226, Pl. 98, Fig. 2, 7; Pl. 99, Fig. 2, 6.—Barrera and Diaz-Ungria, 1957:171. — Machado-Allison, 1963:275.—1966:24.

REMARKS

X. brasiliensis, an important vector of plague in Venezuela, occurs on *Rattus norvegicus* in urban areas. We did not collect this species in Venezuela.

Xenopsylla cheopis (Rothschild)

Pulex cheopis Rothschild, 1903a:85, Pl. 1, Fig. 3, 9; Pl. 2, Fig. 12, 19.

Xenopsylla pachyruromyidis Glinkiewicz, 1907:385, Pl. 2, Fig. 1-4.

Xenopsylla cheopis, Rothschild, 1910:92, Fig. 9, 11.—Anduze, Vogelsang, and Pifano, 1947:4.—Jordan, 1950:599.—Traub, 1950:89, 109, 112, Pl. 53, Fig. 1.—Hopkins and Rothschild, 1953:248-260, Fig. 20A, 76, 199, 220, 246, 255, 259, 266, 286, 305-308, 310, 391; Pl. 2, 22D-F, 39A, 40E.—Johnson, 1957:225-227, Pl. 98, Fig. 1, 3, 4, 5, 8; Pl. 2, Fig. 12, 19.—Barrera and Diaz-Ungria, 1957:163, 170, 171, Lan. 11, Fig. 2.—Cova Garcia and Tallaferro, 1959:328, 331, 340, 347.—Machado-Allison, 1963:275.—1966:24, 30-32, Fig. 10.—Tipton and Mendez, 1966:294, 295, Pl. 52, 53.

Type Data: Holotype male ex *Acomys witherbyi*, Sudan: near Shendi, 5-III-1901, N. C. Rothschild and A.F.R. Wollaston, collectors
Other Recorded Distribution: Cosmopolitan.

VENEZUELAN RECORDS (4 males and 1 female)

Three specimens were collected from *Rattus rattus* (Dto. Federal and Monagas) and the remaining 2 specimens were collected from *Oryzomys albigularis* (Dto. Federal) and *Sigmodon hispidus* (Carabobo).

REMARKS

Barrera and Diaz-Ungria (1957) have published records of *X. cheopis* from Caracas ex *Rattus rattus* (*R. r. alexandrinus* and *R. r. rattus*), *R. norvegicus* and in the state of Aragua ex "ratas de Campo." During a three year collecting period (1965-1968) more than 102 specimens of the genus *Rattus* were collected from which only 3 specimens of *X. cheopis* were taken, indicating that the widespread use of insecticides may have reduced the population of this flea.

Genus *Hectopsylla* Frauenfeld

Hectopsylla Frauenfeld, 1860:464.

Type Species: *Hectopsylla psittaci* Frauenfeld.

Hectopsylla psittaci Frauenfeld

Hectopsylla psittaci Frauenfeld, 1860:464.—Vogelsang, 1939:168-172. — Hopkins and Rothschild, 1953:52-53, Fig. 40, 41.—Johnson, 1957:236, Pl. 110, 111, Fig. 2.—Barrera and Diaz-Ungria, 1957:174. — Machado-Allison, 1963:275.—1966:24.

REMARKS

H. psittaci is a parasite of birds, and since our major effort was directed toward collecting ectoparasites of mammals it is not surprising that we did not collect it.

Genus *Rhynchopsyllus* Haller

Rhynchopsyllus Haller, 1880:72.

Type Species: *Rhynchopsyllus pulex* Haller.

Rhynchopsyllus pulex Haller
(Fig. 1)

Rhynchopsyllus pulex Haller, 1880:82, Pl. 6, Fig. 1-13.—Traub and Gammons, 1950:271, Fig. 6, 7.—Johnson, 1957:237-238, Pl. 112, Fig. 3, 5.—Barrera and Diaz-Ungria, 1957:170.—Machado-Allison, 1963:271, 272, 275.—1966:24.—Tipton and Mendez, 1966:296.

Type Data: Descriptions based on females ex *Molossus* species, Brazil.

Other Recorded Distribution. Argentina: ex *Zonotrichia pileata*, *Myotis nigricans* and

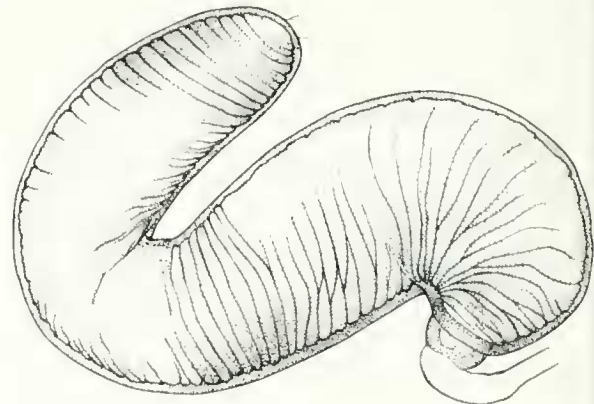


Fig. 1. *Rhynchopsyllus pulex* Haller. Female: spermatheca.

Nyctinomus brasiliensis (= *Tadarida brasiliensis*). Bolivia: ex *Molossus obscurus*. Brazil: ex *Histiopus velatus*, *Nyctinomus macrotis* (= *Tadarida macrotis*), *Molossus obscurus*, and *Eumops perotis*. Chile: ex *Nyctinomus brasiliensis* (= *Tadarida brasiliensis*). Colombia: ex *Molossus obscurus*. Ecuador: ex *Rhipidomys leucodactylus* and "bat." Peru: ex *Molossus obscurus* and *Histiopus* species. Venezuela: ex *Vespertilio fuscus* (= *Eptesicus fuscus*) and *Myotis nigricans*.

VENEZUELAN RECORDS (3 females)

Our material consists of three females ex *Molossus major* (SVP 4665 and SVP 4713), Dto. Federal, El Limón, about 400 m. elev., 19, 20-VIII-1966.

REMARKS

Although based on meager evidence, it appears that *R. pulex* is associated with molossid bats at low elevations.

Genus *Tunga* Jarocki

Tunga Jarocki, 1838:50.

Type Species: *Pulex penetrans* (Linnaeus).

Tunga penetrans (Linnaeus)

Pulex penetrans Linnaeus, 1758:614.

Tunga penetrans, Jarocki, 1838:50, Fig. 10-13.—Vogelsang, 1948:145-151. — Hopkins and Rothschild, 1953:39-43, Fig. 21, 22A, 23, 26A, 28, 37; Pl. 6A, B, 7A-C, 8B.—Johnson, 1957:240, Pl. 113, 114.—Barrera and Diaz-Ungria, 1957:172. — Machado-Allison, 1963:275.—1966:24.—Tipton and Mendez, 1966:295, Pl. 48, Fig. 1; Pl. 49, Fig. 1, 2.

REMARKS

Barrera and Diaz-Ungria (1957) record *T. penetrans* from *Sus scrofa*, *Bos taurus*, *Myrmecophaga tridactyla*, and *Homo sapiens*. We did not collect this species.

Family Rhopalopsyllidae

Genus *Rhopalopsyllus* Baker

Rhopalopsyllus Baker, 1905:128, 129, 143.

Type Species: *Pulex lutzi* Baker.

Rhopalopsyllus australis australis (Rothschild)
(Fig. 2, 3)

Pulex australis Rothschild, 1904:613, Pl. 9, Fig. 29, Pl. 10, Fig. 34, 36.

Rhopalopsyllus australis, Jordan and Rothschild, 1908:71, Pl. 3, Fig. 11; Pl. 4, Fig. 10, 11.

Rhopalopsyllus australis australis, Jordan and

Rothschild, 1923b:327, Fig. 338.—Ewing and Fox, 1943:21. — Guimarães, 1940:235-236.—Anduze, Vogelsang, and Pifano, 1947:4.—Costa Lima and Hathaway, 1946:140.—Traub and Johnson, 1952:131.—Johnson, 1957:175.—Barrera and Diaz-Ungria, 1957:164, 182.—Cova Garcia and Tallaferro, 1959:331, 347.—Machado-Allison, 1962b:188. — 1966:26, 35, Fig. 12.

Type Data: Type material consists of 3 males and 13 females ex *Dicotyles labiatus* (= *Tayassu pecari*), Mexico: Santa Andréa, Tabasco, 30-V-1897.

Other Recorded Distribution: Mexico: ex *Tamandua tetradactyla*. Panama: ex *Tamandua tetradactyla chiriquensis*. Trinidad: ex *Agouti paca*, *Didelphis marsupialis*, and deer. Venezuela: ex *Didelphis marsupialis*, and *Akodon urichi*.

VENEZUELAN RECORDS (82 males and 143 females)

There were 17 males and 23 females ex 6 *Dasyprocta aguti* from Bolívar, Carabobo, and the border between Falcón and Yaracuy; 7 males and 16 females ex 10 *Didelphis marsupialis* from Bolívar, Falcón, Miranda, Monagas, Yaracuy, and Zulia; 8 males and 12 females ex 3 *Tayassu tajacu* from Apure, Barinas, and Bolívar; 2 males and 8 females ex 5 *Tayassu pecari* from Bolívar; 7 males and 24 females ex 4 *Tamandua longicaudata* from T. F. Amazonas, Apure, Monagas, and Zulia; 1 male and 4 females ex 3 *Tamandua tetradactyla* from Monagas and Zulia; 5 males and 4 females ex 2 *Myoprocta pratti* from T. F. Amazonas; 2 males and 5 females ex 5 *Cerdocyon thous* from Bolívar, Monagas, and Trujillo; 2 males and 5 females ex 3 *Conepatus semistriatus* from Monagas, Zulia, and the border between Carabobo and Yaracuy; and 4 males and 21 females ex 3 *Mazama americana* from Apure and Bolívar. Other hosts include: *Proechimys semispinosus* (Trujillo and Zulia); *Proechimys guyanensis* (Bolívar); *Agouti paca* (Bolívar and Zulia); *Dasyprocta fuliginosa* (T. F. Amazonas); *Dasyprocta* sp. (Apure); *Procyon cancrivorus* (Zulia and Táchira); *Eira barbara* (Barinas); *Galeotis vittata* (Monagas); *Felis pardalis* (Bolívar and Zulia); *Homo sapiens* (Bolívar); *Artibeus jamaicensis*² (Monagas); *Carollia perspicillata*¹ (Falcón); and *Desmodus rotundus*² (Monagas).

REMARKS

R. australis australis was collected from many hosts representing several families, indicating a broad ecological tolerance. More particularly it was collected from hystricomorph rodents (*Dasyproctidae*), edentates, marsupials, carnivores, and two genera of Artiodactyla.

Rhopalopsyllus cacicus sacrus

Jordan and Rothschild

(Fig. 4, 5)

Rhopalopsyllus cacicus Jordan and Rothschild, 1908:73, Pl. 3, Fig. 13, Pl. 4, Fig. 8.

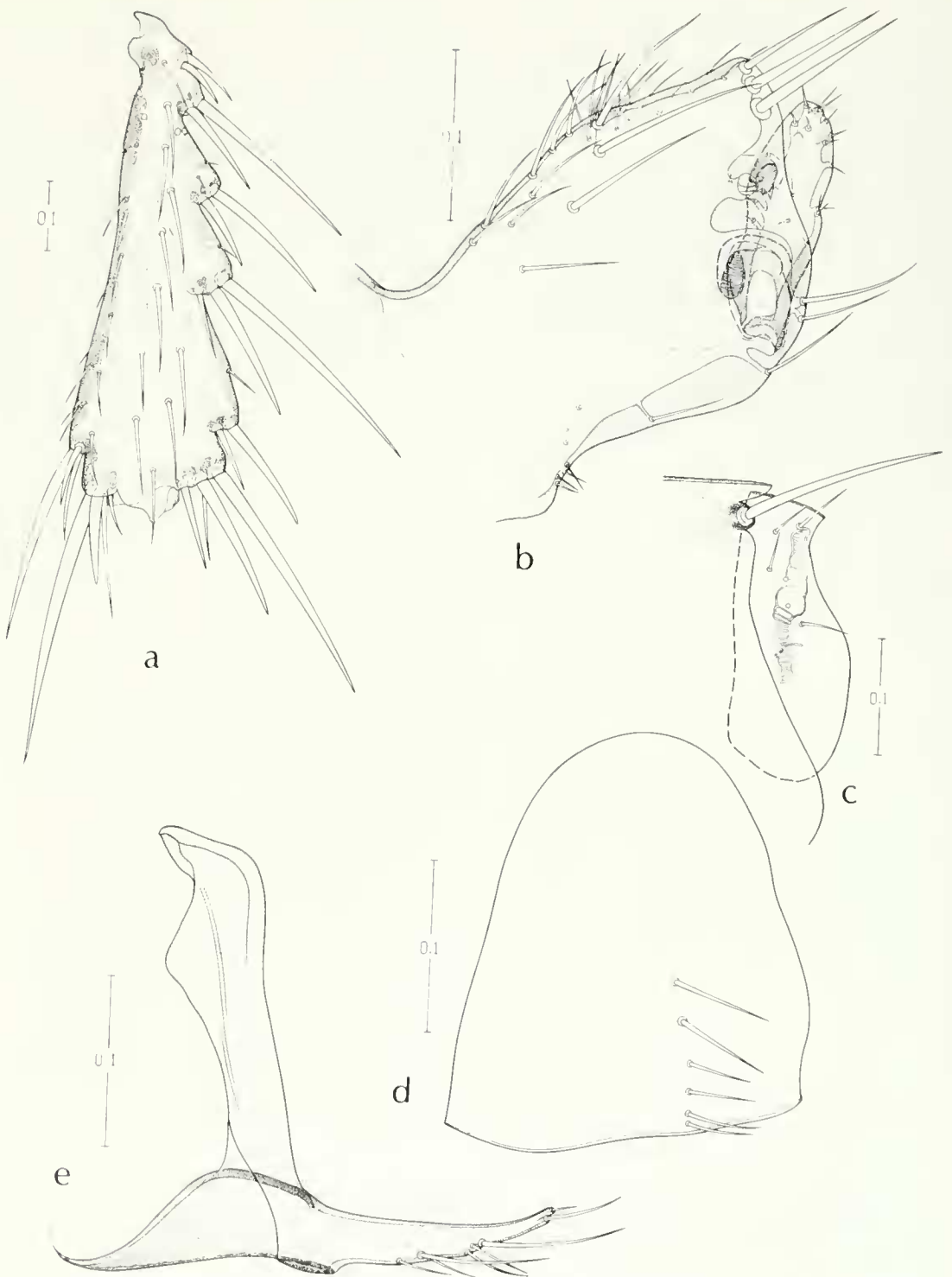


Fig. 2. *Rhopalopsyllus australis australis* (Rothschild). Male: a, metatibia. b, process and movable finger of clasper. c, seventh and eighth abdominal terga. d, eighth sternum. e, ninth sternum.

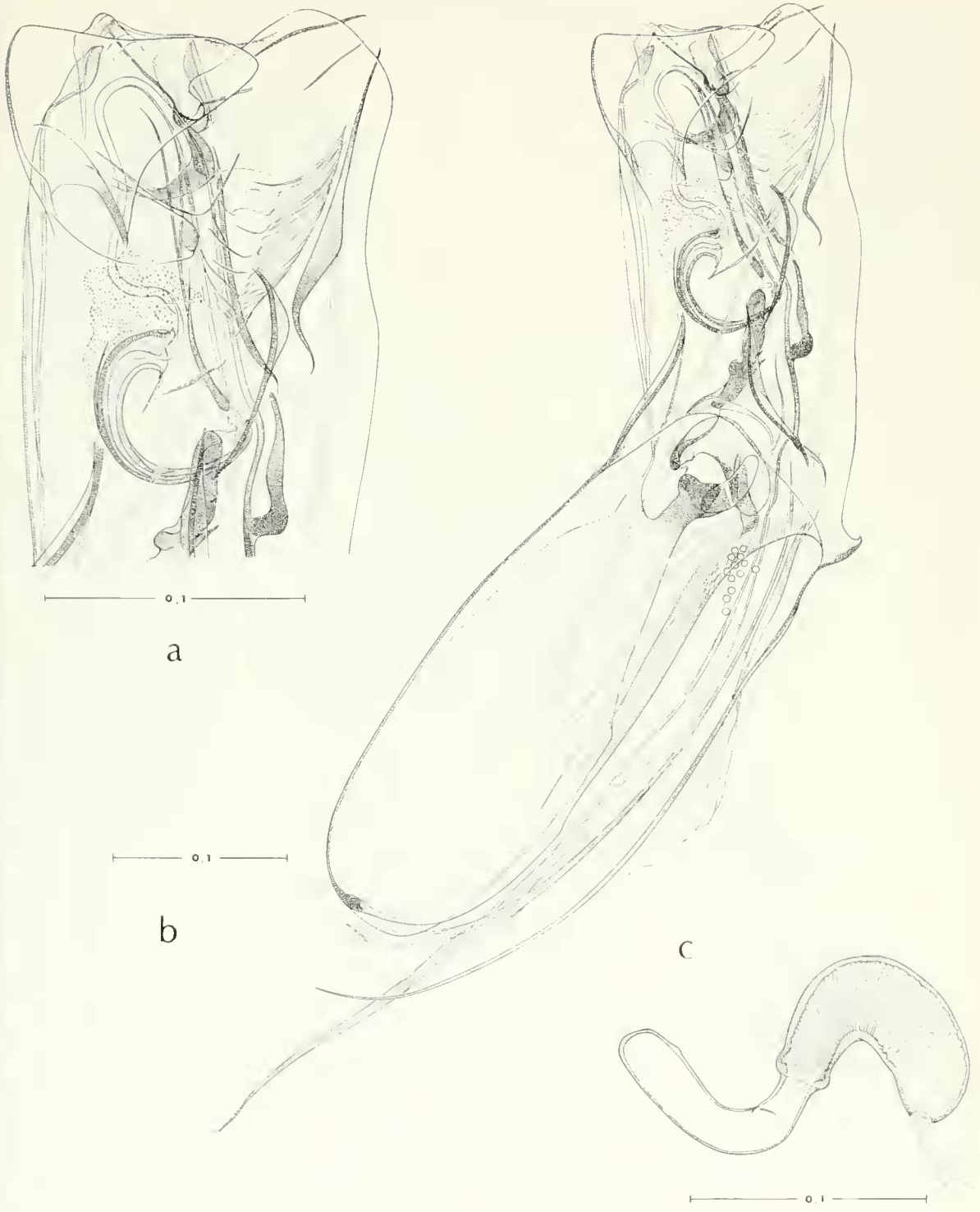


Fig. 3. *Rhopalopsyllus australis australis* (Rothschild). Male: a, apex of aedeagus. b, aedeagus. Female: c, spermatheca.

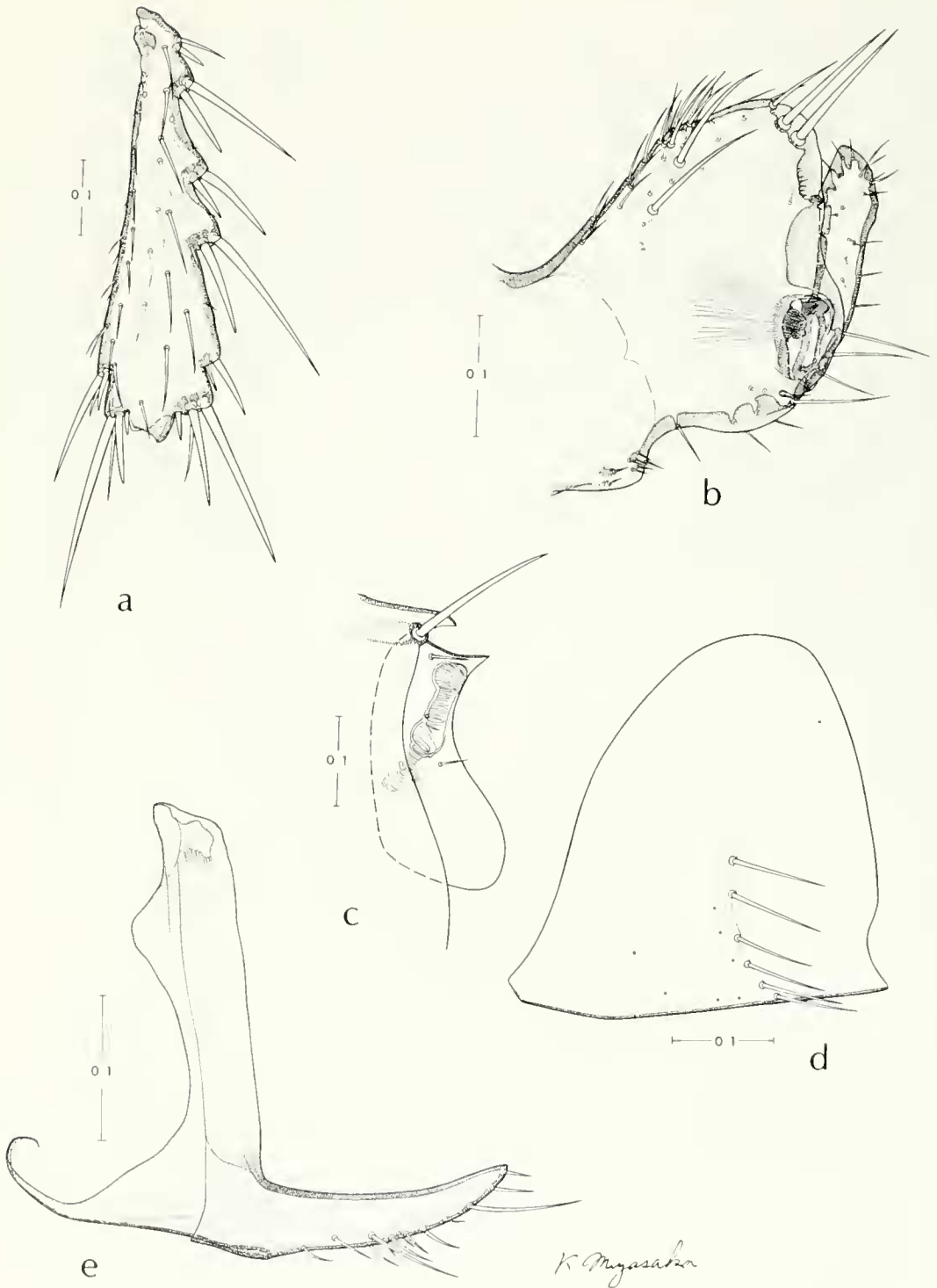


Fig. 4. *Rhopalopsyllus cacicus saetus* Jordan and Rothschild. Male: a, metatibia. b, process and movable finger of clasper. c, seventh and eighth abdominal terga. d, eighth sternum. e, ninth sternum.

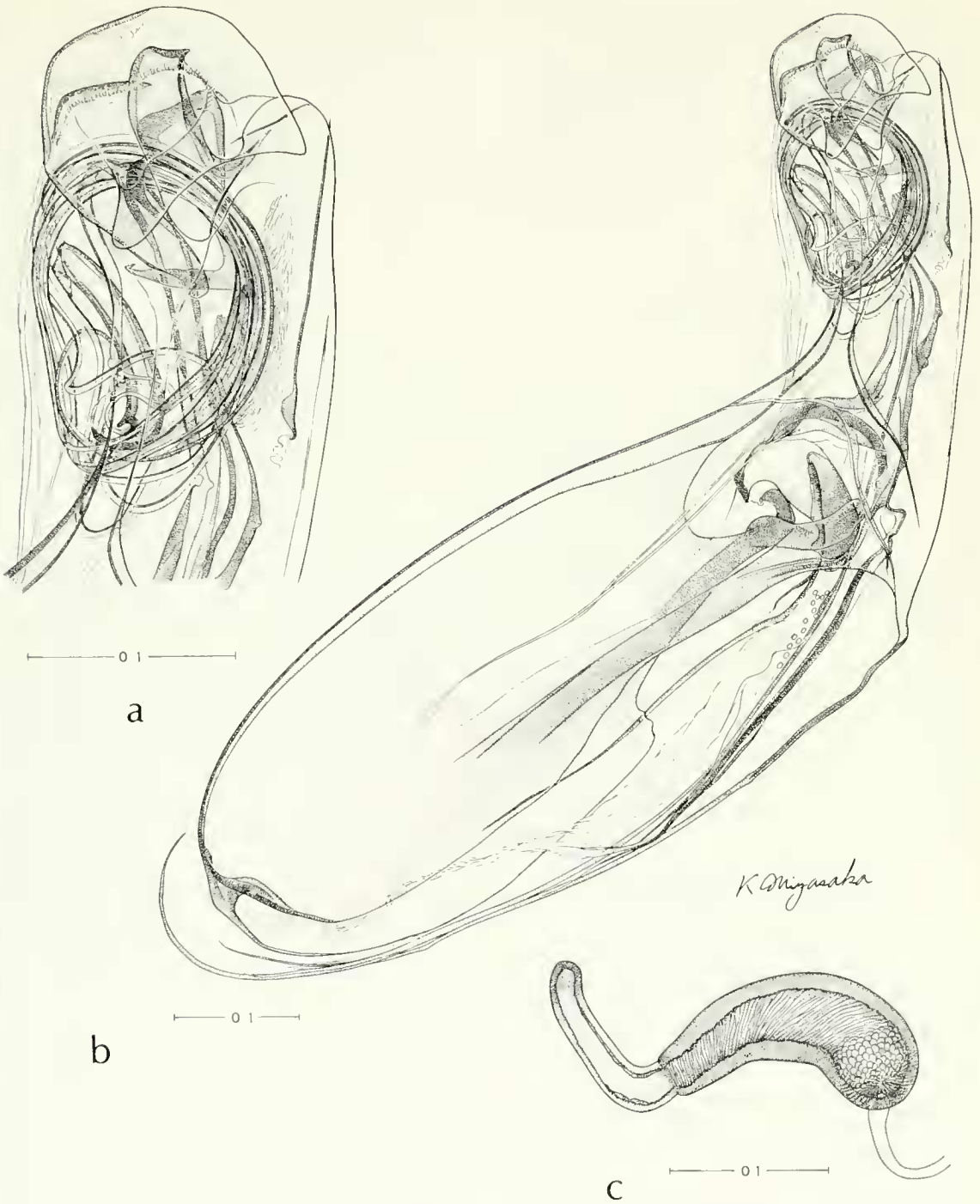


Fig. 5. *Rhopalopsyllus cacicus saevus* Jordan and Rothschild. Male: a, apex of aedeagus, b, aedeagus. Female: c, spermatheca.

Rhopalopsyllus cacicus saevus Jordan and Rothschild, 1923b:325, Fig. 332.—Jordan, 1939:445, Fig. 328.—Guimarães, 1940:244.—Ewing and Fox, 1943:21.—Costa Lima and Hathaway, 1946:141.—Traub and Johnson, 1952:131.—Cova García and Tallaferro, 1959:331, 347.—Johnson, 1957:176.—Barrera and Diaz-Ungria, 1957:164, 183.—Machado-Allison, 1966:26, 32, 35, Fig. 12.—Tipton and Mendez, 1966:301, 303, Pl. 55, Fig. 3; Pl. 59, Fig. 5, 6.

Type Data: Two males, one female ex *Felis pardalis mearnsi*, Panama: La Cabima, L. H. Dunn collector. One male ex *Didelphis marsupialis*, Trinidad: Capara, V-1921, S. M. Klages collector.

Other Recorded Distribution: Colombia: ex *Didelphis marsupialis*. Guatemala: ex *Dasyppus novemcinctus mexicanus*. Venezuela: ex *Didelphis m. marsupialis*.

VENEZUELAN RECORDS (5 males and 1 female)

Four specimens were collected ex 3 *Didelphis marsupialis* in Falcón, Lara, and Yaracuy; 1 male each from *Conepatus semistriatus* in Yaracuy, and *Proechimys semispinosus* in Carabobo.

REMARKS

In Panama *R. cacicus saevus* was collected in large numbers from *Dasyppus novemcinctus fenestratus* and its burrows near sea level. We suspect that it is not so rare in Venezuela as our records indicate but that we failed to discover its optimum locality and host.

Rhopalopsyllus lugubris lugubris Jordan and Rothschild (Fig. 6, 7)

Rhopalopsyllus lugubris Jordan and Rothschild, 1908:74, Pl. 3, Fig. 12; Pl. 6, Fig. 9.—Jordan and Rothschild, 1923b:325, 350, Fig. 333, 334c, 336, 337.—Barrera and Diaz-Ungria, 1957:164, 183, 184.

Rhopalopsyllus lugubris lugubris, Johnson, 1957:177, Pl. 92, Fig. 4; Pl. 93, Fig. 4.—Machado-Allison, 1966:35, Fig. 12.—Tipton and Mendez, 1966:302, Pl. 55, Fig. 2; Pl. 59, Fig. 3, 4.

Type Data: Holotype male ex *Speothos venaticus*, Bolivia: Charuplaya, P. O. Simons collector.

Other Recorded Distribution: Brazil: ex *Coelogenys paca* (= *Agouti paca*). Panama: ex *Didelphis marsupialis caucav*, *Zygodontomys microtinus* (= *Z. brevicauda*), *Proechimys semispinosus panamensis*, *Agouti paca virgatus*, and *Dasyprocta punctata isthmica*. Peru: ex *Didelphis marsupialis*, *Felis*

species, and "hamster." Venezuela: ex *Coelogenys paca* (= *Agouti paca*).

VENEZUELAN RECORDS (82 males and 153 females)

There were 75 males and 131 females ex 16 *Agouti paca* in Bolívar, Falcón, T. F. Amazonas, Apure, and Zulia. An additional 29 specimens were collected from *Mazama americana* (Bolívar), *Didelphis marsupialis* (Monagas and T. F. Amazonas), *Didelphis azarae* (T. F. Amazonas), *Bassaricyon gabbi* (T. F. Amazonas), *Dasyprocta aguti* (Carabobo), and *Proechimys semispinosus* (Zulia).

Over 87% of our specimens were collected from *Agouti paca* and almost 90% were collected at 150 meters elevation or lower. There were 16 specimens of *A. paca* from which we collected 206 fleas (flea index almost 13) while there were 29 fleas collected from the remaining 8 hosts (flea index about 3.6).

Rhopalopsyllus lutzi cleophontis (Rothschild)

Pulex cleophontis Rothschild, 1904:614, Fig. 32.

Rhopalopsyllus cleophontis, Baker, 1905:130.

Rhopalopsyllus lutzi cleophontis, Jordan and Rothschild, 1923b:323, Fig. 329.—Guimarães, 1940:244.—Johnson, 1957:178.—Barrera and Diaz-Ungria, 1957:183.—Machado-Allison, 1963:274, 276.—1966:26.

REMARKS

It is surprising that we did not collect *R. lutzi cleophontis* since it is parasitic on *Agouti paca* and *Dasyppus novemcinctus*, hosts which we encountered frequently in our collecting.

Genus *Polygenis* Jordan

Polygenis Jordan, 1939:444.

Type Species: *Pulex roberti* Rothschild.

Polygenis atopus (Jordan and Rothschild)
(Fig. 8, 9)

Rhopalopsyllus atopus Jordan and Rothschild, 1922:267, Fig. 259, 260.

Polygenis atopus, Guimarães, 1940:233.—1948:540, Fig. 1b.—Costa Lima and Hathaway, 1946:144.—Johnson, 1957:158, 159.—Machado-Allison, 1962b:179.—Tipton and Mendez, 1966:297, 329, Pl. 55.—Del Ponte, 1967:56, 57.

Type Data: Male holotype, two females ex *Didelphis aurita* (= *D. marsupialis aurita*), Brazil: Sta. Catharina, Joinville, Humboldt, 13-X-1913, W. Ehrhardt collector.

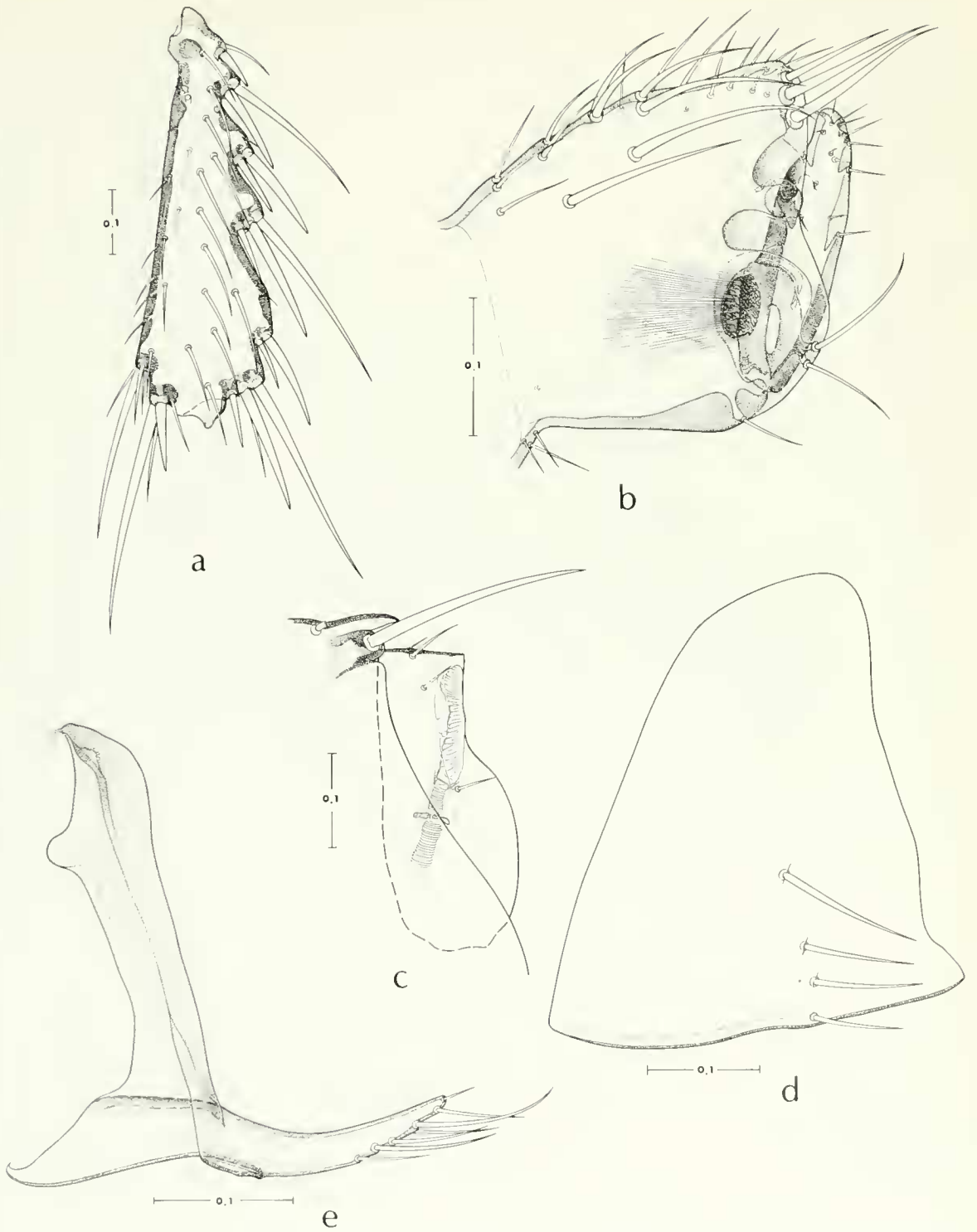


Fig. 6. *Rhopalopsyllus lugubris lugubris* Jordan and Rothschild. Male: a, metatibia. b, process and movable finger of clasper. c, seventh and eighth abdominal terga. d, eighth sternum. e, ninth sternum.

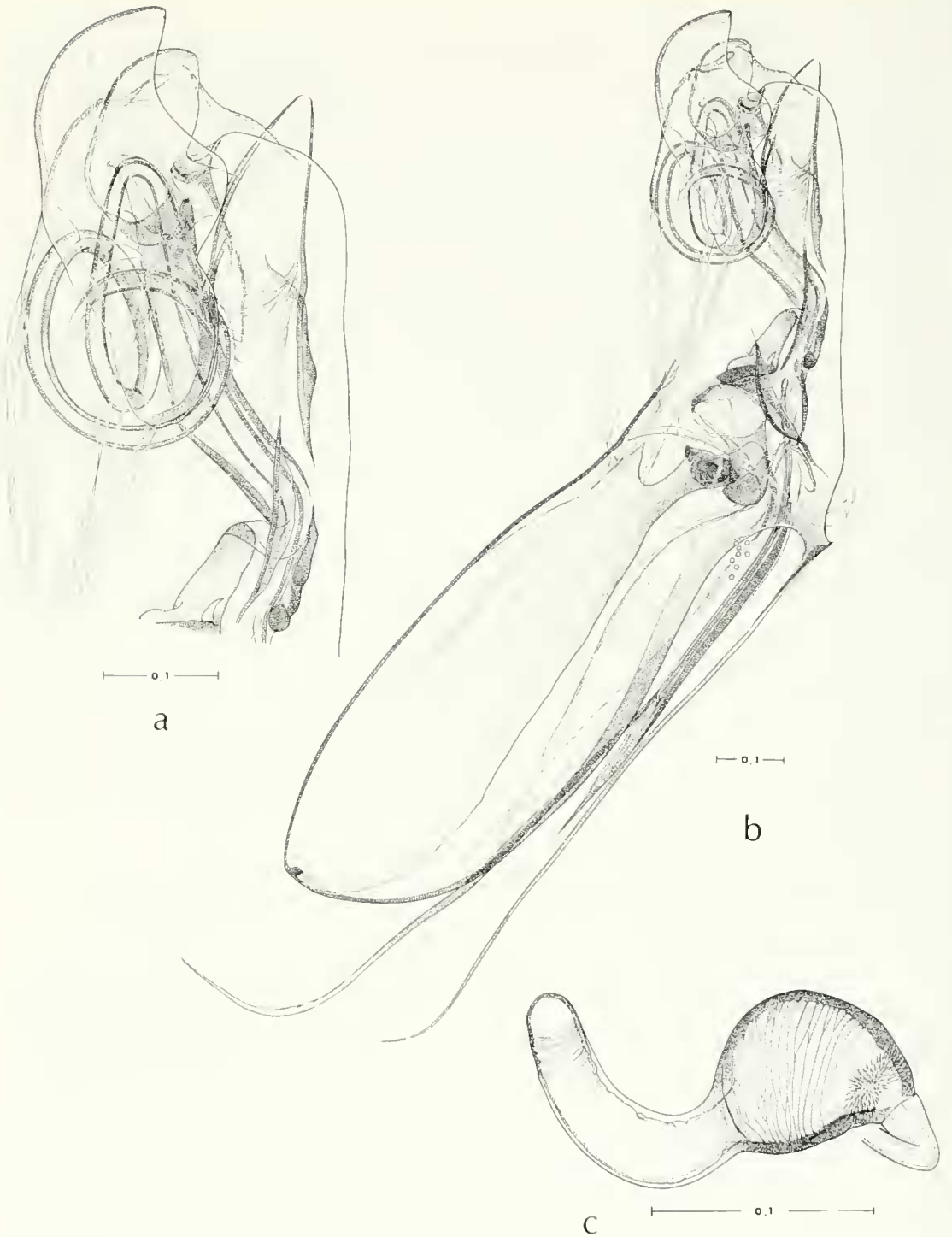


Fig. 7. *Rhopalopsyllus lugubris lugubris* Jordan and Rothschild. Male: a, apex of aedeagus. b, aedeagus. Female: c, spermatheca.



Fig. 8. *Polygenis atopus* (Jordan and Rothschild). Male: a, metatibia. b, process and movable finger of clasper. c, seventh and eighth abdominal terga. d, eighth sternum. e, ninth sternum.

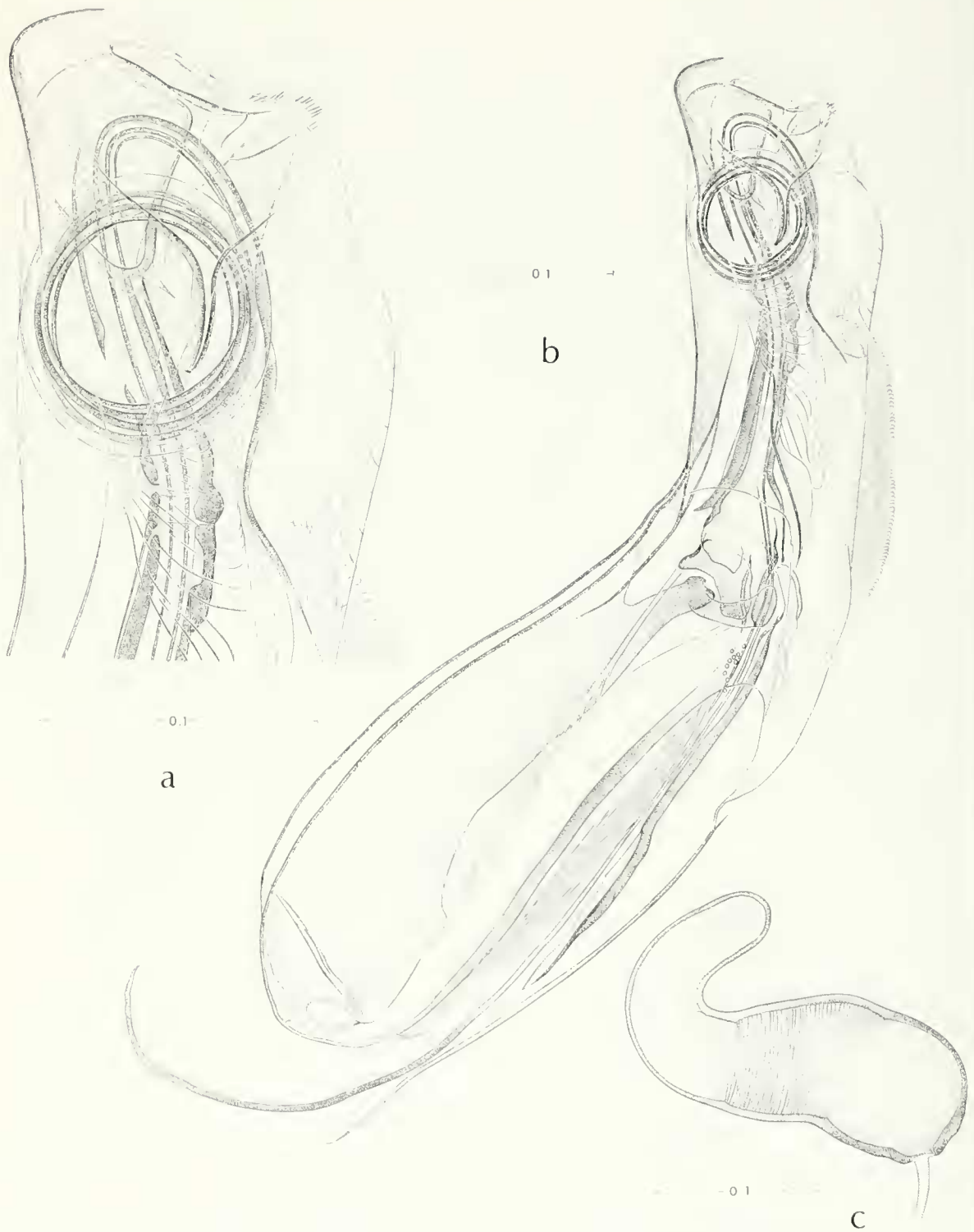


Fig. 9. *Polygenis atopus* (Jordan and Rothschild), Male: a, apex of aedeagus, b, aedeagus. Female: c, spermatheca.

Other Recorded Distribution: Argentina: ex *Didelphis marsupialis*, *Didelphis marsupialis aurita*, and *Felis catus* (type of *truncatus*); Panama: *Peromyscus n. nudipes*, and *Oryzomys albigularis*.

VENEZUELAN RECORDS (28 males and 20 females)

Eight males and 9 females ex 11 *Oryzomys albigularis* from Dto. Federal; 5 males and 5 females ex 3 *Neacomys tenuipes* from Dto. Federal and Trujillo; 4 males and 4 females ex 5 *Oryzomys concolor* from Dto. Federal and Trujillo; and 5 males and 2 females ex 3 *Didelphis marsupialis* Dto. Federal and Trujillo. Other hosts include: *Oryzomys minutus* (Dto. Federal), *Proechimys semispinosus* (Falcón), *Monodelphis breviceaudata* (Carabobo), and *Bradypus infuscatus* (Miranda).

REMARKS

Specimens from Venezuela resemble illustrations given by Jordan and Rothschild (1922) except that the sinus in the caudal margin of the seventh sternum of the female is not quite so distinct as they have illustrated it. Our specimens are very close to those illustrated by Tipton and Mendez (1966) from Panama. Johnson (1965) studied the Panama specimens and suggested they were *P. atopus*. *P. atopus* is the only species in the genus which is not abundant at sea level. Most of our specimens were collected above 1400 meters elevation. *Oryzomyines*, and perhaps more specifically *Oryzomys* species, probably represent the preferred hosts of *P. atopus*. Marsupials may figure prominently in maintaining a link between populations which are more or less isolated at high elevations.

Polygenis bohlsi bohlsi (Wagner)

(Fig. 10, 11, 29f)

Pulex bohlsi Wagner, 1901:21, Pl. 1, Fig. 6.

Rhopalopsyllus bohlsi, Baker, 1905:130, 143.

Rhopalopsyllus bohlsi bohlsi, Guimarães, 1940:234.

Polygenis bohlsi bohlsi, Guimarães, 1948:540, Fig. 1d.—Traub and Johnson, 1952:127, Fig. 32-35.—Barrera and Diaz-Ungria, 1957:164, 187, Lam. 1, Fig. 1-3.—Cova García and Tallaferro, 1959:329, 331, 332, 334, 346.—Machado-Allison, 1962a:181. — 1963:270, 276.—1966:26, 34, Fig. 5, 12.—Del Ponte, 1967:69.

Type Data: Hosts unknown, Paraguay: J. Bohls collector.

Other Recorded Distribution: Argentina: ex *Didelphys azarae* (= *Didelphis azarae*), *Deltamys kempi* (= *Akodon kempi*). Brazil: ex *Oryzomys expulsus* (= *Calomys expul-*

sus). Ecuador: ex *Nectomys saturatus* (= *N. squamipes saturatus*). Paraguay: ex *Didelphis azarae*. Venezuela: ex *Didelphis m. marsupialis*, *Sciurus granatensis chapmani*, *Heteromys a. anomalus*, *Oryzomys fulvescens delicatus*, *Oecomys t. trinitatis* (= *Oryzomys concolor*), *Neacomys spinosus* (= *N. tenuipes*), *Akodon urichi urichi*, *Sigmodon hispidus hirsutus*, *Rattus rattus frugivorus*, and *Proechimys cayennensis trinitatis* (= *P. semispinosus trinitatis*).

VENEZUELAN RECORDS (51 males and 66 females)

There were 14 males and 21 females ex 15 *Akodon urichi* in Aragua, Bolívar, Carabobo, Dto. Federal, and Guárico; 12 males and 23 females ex 21 *Sigmodon hispidus* in Dto. Federal and Carabobo; 5 males and 3 females ex 5 *Monodelphis breviceaudata* in Aragua and Carabobo; and 4 males and 6 females ex 5 *Zygodontomys breviceauda* in Monagas and Sucre. Other hosts include: *Oryzomys albigularis* (Aragua), *Marmosa murina* (Bolívar), *Marmosa robinsoni* (Lara), *Proechimys semispinosus* (Carabobo), *Mustela frenata* (Monagas), *Oryzomys fulvescens* (Monagas and Carabobo), *Sigmodon alstoni* (Sucre), *Holochilus brasiliensis* (Apure and Carabobo), *Didelphis marsupialis* (Miranda), *Cavia porcellus* (Carabobo), *Sciurus igniventris* (Bolívar), and bird? (Carabobo).

REMARKS

Our specimens differ considerably from specimens from Brazil loaned to us by Dr. Guimarães, but fit the description and illustrations given by Traub and Johnson (1952). We suggest that the optimum habitat is at elevations between 1,000 and 1,500 meters and the preferred hosts are cricetine rodents and perhaps more specifically akodont stock.

Polygenis dunnii (Jordan and Rothschild)

(Fig. 12, 13)

Rhopalopsyllus dunnii Jordan and Rothschild, 1922:269, Fig. 261, 262.—Jordan and Rothschild, 1923b:336, 351.

Rhopalopsyllus (Polygenis) dunnii, Ewing and Fox, 1943:22.

Polygenis dunnii, Costa Lima and Hathaway, 1946:144.—Johnson, 1957:160, 161.—Machado-Allison, 1962b:183.—1963:273, 276.—1966:19, 26, 34, 35, Fig. 5, 12.—Tipton and Mendez, 1966:298, 300, 326-332, Pl. 56, Fig. 1; Pl. 57, Fig. 1, 2.

Polygenis ambersoni Traub and Johnson, 1952:112, Fig. 1-4, 6, 9, 10, 12-14, 16.—Barrera and Diaz-Ungria, 1957:164, 187.—Cova García and Tallaferro, 1959:331, 341, 344, 346.

Type Data: Male holotype, paratype female ex *Sigmodon hispidus chiriquensis*. Panama:

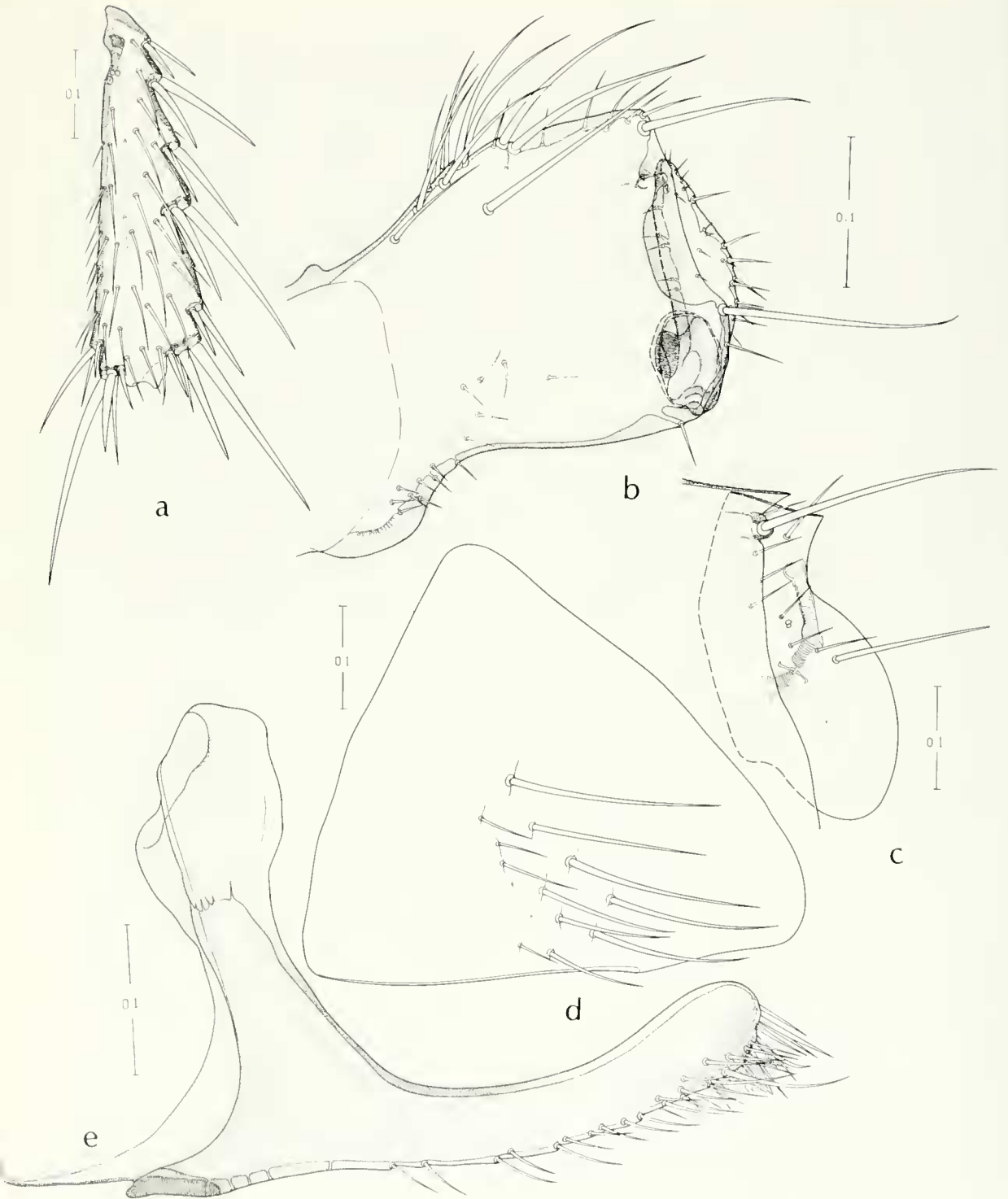


Fig. 10. *Polygenis bohlsi bohlsi* (Wagner). Male: a, metatibia. b, process and movable finger of clasper. c, seventh and eighth abdominal terga. d, eighth sternum. e, ninth sternum.

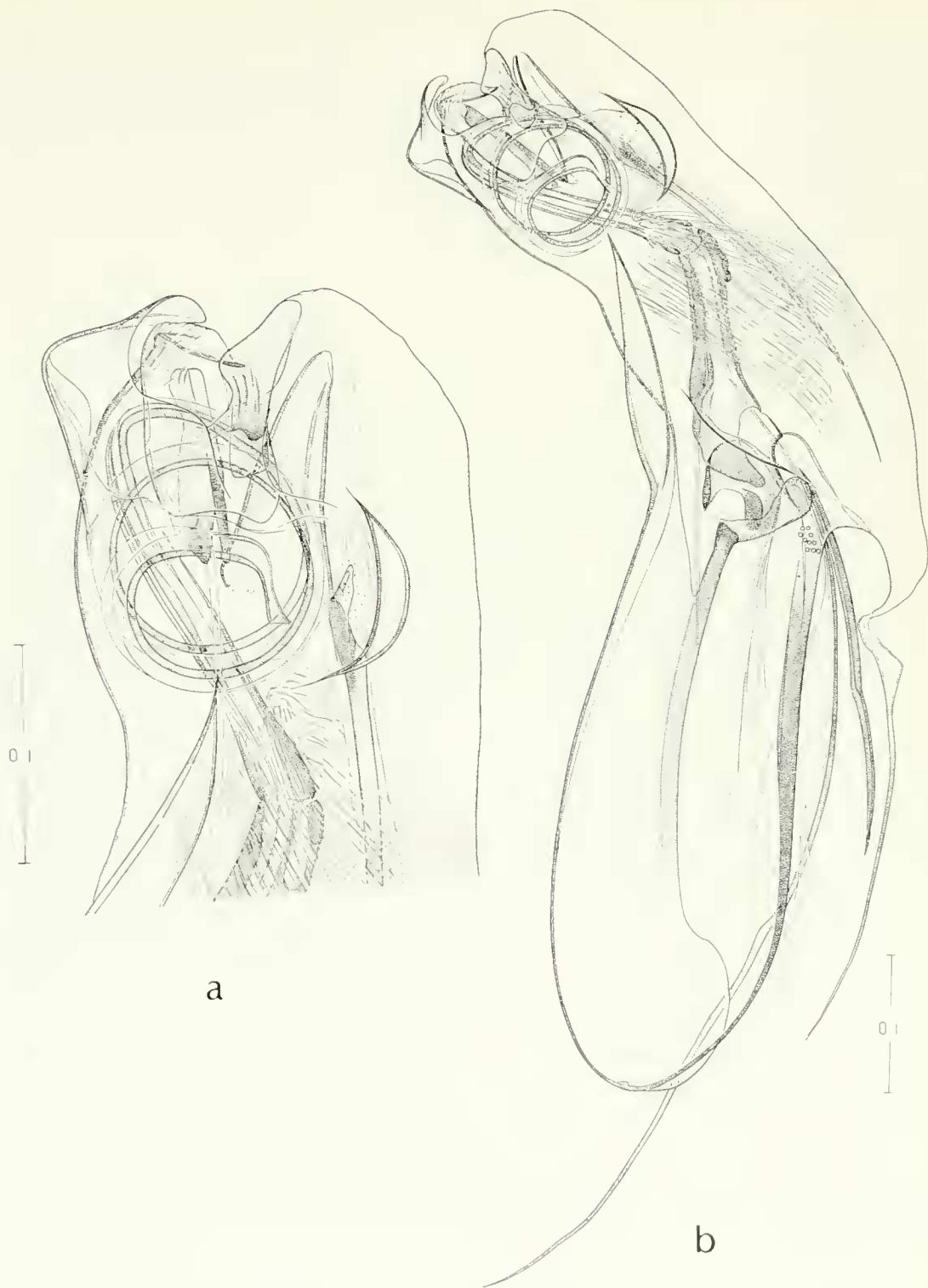


Fig. 11. *Polygenis bohlsi bohlsi* (Wagner). Male: a, apex of aedeagus. b, aedeagus.

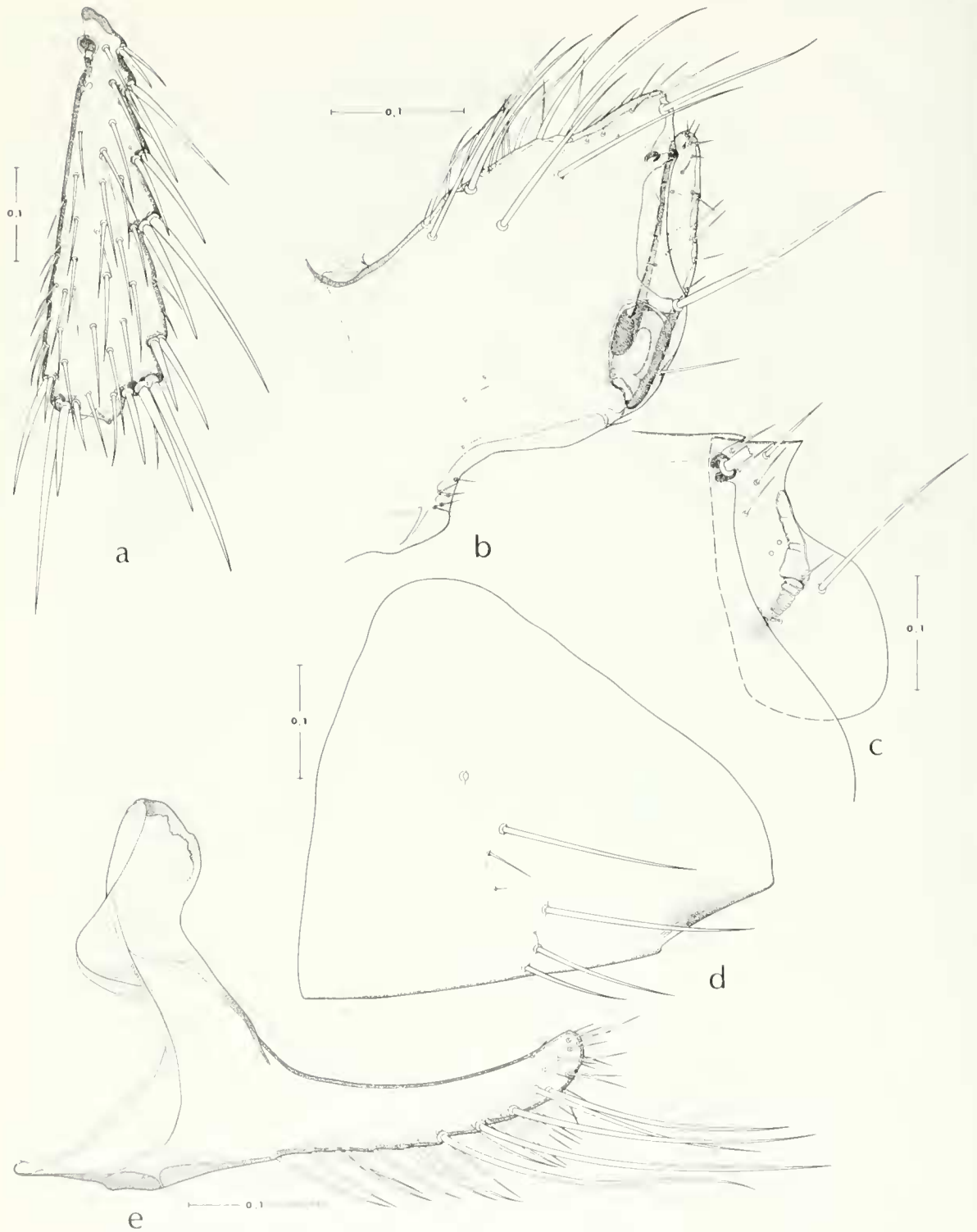


Fig. 12. *Polygenis dunni* (Jordan and Rothschild). Male: a, metatibia. b, process and movable finger of clasper. c, seventh and eighth abdominal terga. d, eighth sternum. e, ninth sternum

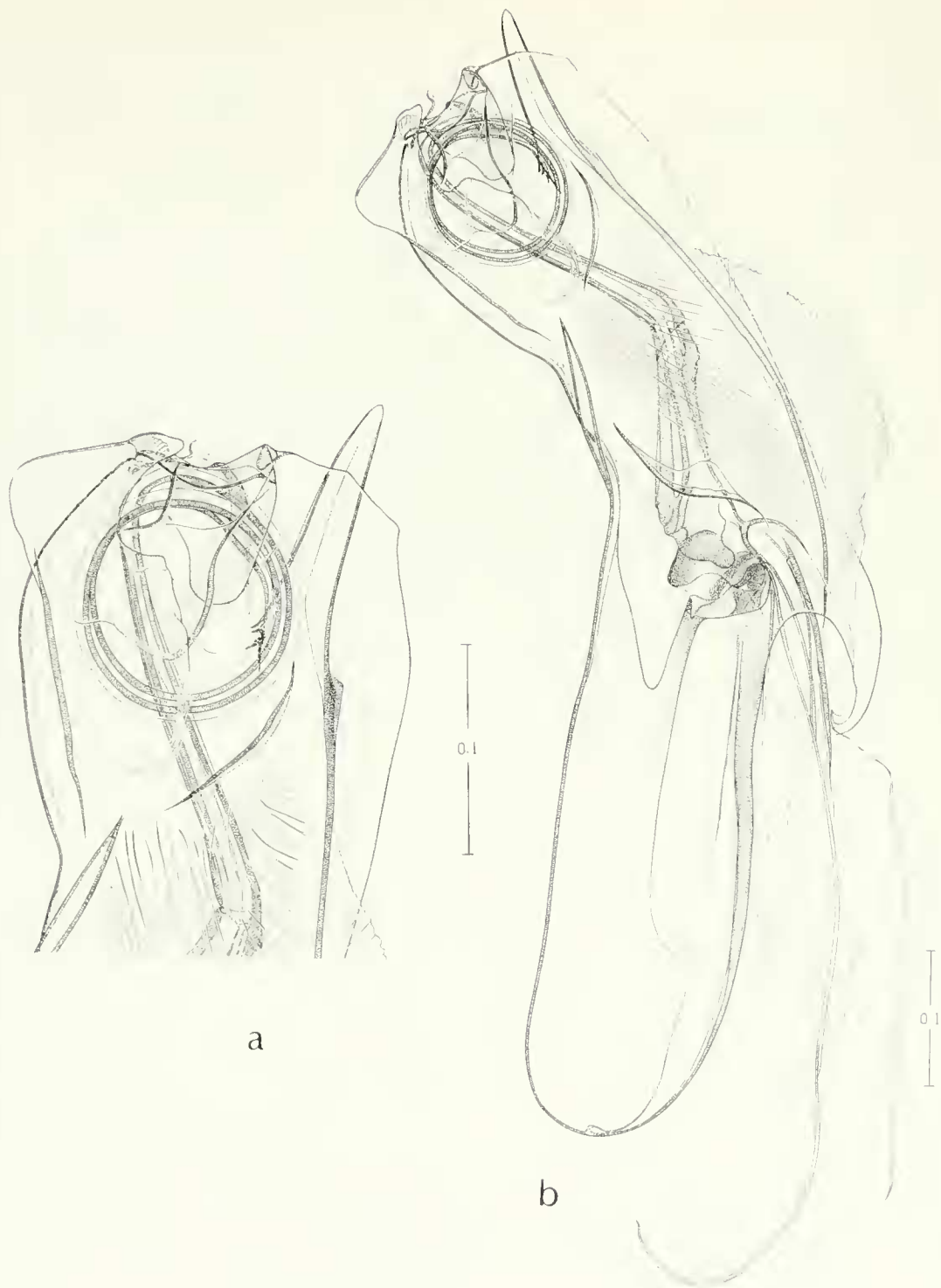


Fig. 13. *Polygenis dunni* (Jordan and Rothschild). Male: a, apex of aedeagus. b, aedeagus.

Canal Zone, Ft. Clayton, L. H. Dunn collector.

Other Recorded Distribution: Venezuela: ex *Sigmodon hispidus hirsutus* (types of *ambersoni*). Trinidad: ex *Heteromys a. anomalus*, and *Nectomys squamipes palmipes*. Panama: ex *Liomys adpersus*, *Metachirus nudicaudatus dentaneus*, *Oryzomys capito*, *Proechimys semispinosus panamensis*, *Sciurus granatensis chiriquensis*, *Sigmodon hispidus chiriquensis*, and *Zygodontomys microtinus* (= *Z. brevicauda*).

VENEZUELAN RECORDS (87 males and 144 females)

There were 56 males and 95 females collected from 58 specimens of *Sigmodon hispidus* of which 48 hosts were collected in Carabobo and 10 in Lara; 9 males and 14 females ex 9 *Heteromys anomalus* (Zulia, Sucre, Falcón, and Trujillo), and 5 males and 8 females ex 8 *Zygodontomys brevicauda* (Falcón, Carabobo, Zulia, and Sucre). Other hosts include: *Prochimys semispinosus* (Zulia, Carabobo, and Lara), *Marmosa robinsoni* (Falcón), *Monodelphis brevicaudata* (Carabobo), *Didelphis marsupialis* (Guárico and Carabobo), *Holochilus brasiliensis* (Carabobo), *Nectomys squamipes* (Carabobo), *Oryzomys fulvescens* (Carabobo), *Cavia porcellus* (Carabobo), *Sciurus granatensis* (Carabobo), *Phyllostomus hastatus*³ (Falcón), *Carollia perspicillata*,³ (T. F. Amazonas), *Vampyrops helleri*² (Barinas), and bird³ (Carabobo).

REMARKS

Male characters resemble very closely illustrations given by Traub and Johnson (1952) (as *P. ambersoni*). The four long bristles on the distal arm of the ninth sternum (DA9) are almost as long as DA9 itself but there is some variation in this character. There are 6 dorsal notches in the hind tibia and 2 bristles in the penultimate notch, but here again in some specimens there may be 7 notches on one leg and 6 on the other and there may be 3 bristles in the penultimate notch. The shape of the crochet appears to be intermediate between *P. dummi* and *P. peronis* as illustrated by Traub and Johnson (1952). It is difficult to separate the females from other closely related species of *Polygenis* and thus it is quite possible that some of the females assigned to this species on the basis of association with males or locality actually belong to another species.

Polygenis frustratus Johnson
(Fig. 14, 15, 29d)

Polygenis frustratus Johnson, 1957:161, 162, Pl. 86, Fig. 1-3, 7; Pl. 87, Fig. 1, 3, 5.—Del Ponte, 1967:57, 70, Fig. 21.

Type Data: Male holotype, female allotype, 2

male and 2 female paratypes ex unknown host, Brazil: State of Santa Catarina, Nova Teutonia, VII-1940, F. Plaumann collector. One male paratype *ibid*, but IV-1942.

Other Recorded Distribution: Argentina: ex species of the following genera: *Scapteromys*, *Oxymycteris*, and *Lutreolina*.

VENEZUELAN RECORDS (7 males and 14 females)

Nineteen specimens were collected near Caracas, Dto. Federal ex 11 *Akodou urichi*. A female specimen ex *Vampyrops oratus*² is probably in error. An additional male specimen ex *Akodou urichi* was collected in Sucre.

REMARKS

Our series probably represents an undescribed subspecies of *P. frustratus* but we are undecided whether it should be a subspecies of *P. frustratus* or *P. pradoi* since it has characters which relate it to both of these species. The immovable process and the movable process of the clasper are more like *P. pradoi* than *P. frustratus* in shape and setation. However, the incrasations of the posterior margin of the immovable process as well as the setae on the distal arm of the ninth sternum are like *P. frustratus*. The posterior margin of the eighth sternum is not sharply triangular as in *P. frustratus* and it is divided to about the same point as in *P. pradoi*. The detailed structure of the aedeagus resembles closely the illustrations given by Johnson (1957) for *P. frustratus*.

Polygenis impavidus Johnson

Polygenis impavidus Johnson, 1957:162, 163, Pl. 88.—Machado-Allison, 1962b:180. — Del Ponte, 1967:57, Fig. 17, 20.

Type Data: Holotype male, allotype female, ex "tara-tara"—"tree rat," Peru: Sandia Province, Dept. of Puno, Tambopata, San Juan, 30-XI-1950, Mrs. H. H. Heller collector. Two male and 2 female paratypes ex *Thomasomys* species, Peru: Dept. of Cuzco, Marcapata, Limapunce, 2400 m elev., 9-VII-1953, C. Kalinowski collector. Two male and 3 female paratypes, *ibid*, but ex *Didelphis* species, 15-VII-1953.

Other Recorded Distribution: None.

VENEZUELAN RECORDS (2 males and 2 females)

All 4 specimens were collected from 2 hosts, *Oryzomys albicularis*, in the state of Miranda near Caracas.

REMARKS

Our specimens key out to *P. impavidus* in Johnson's (1957) key. In her diagnosis she indicates that *P. impavidus* is the only species of

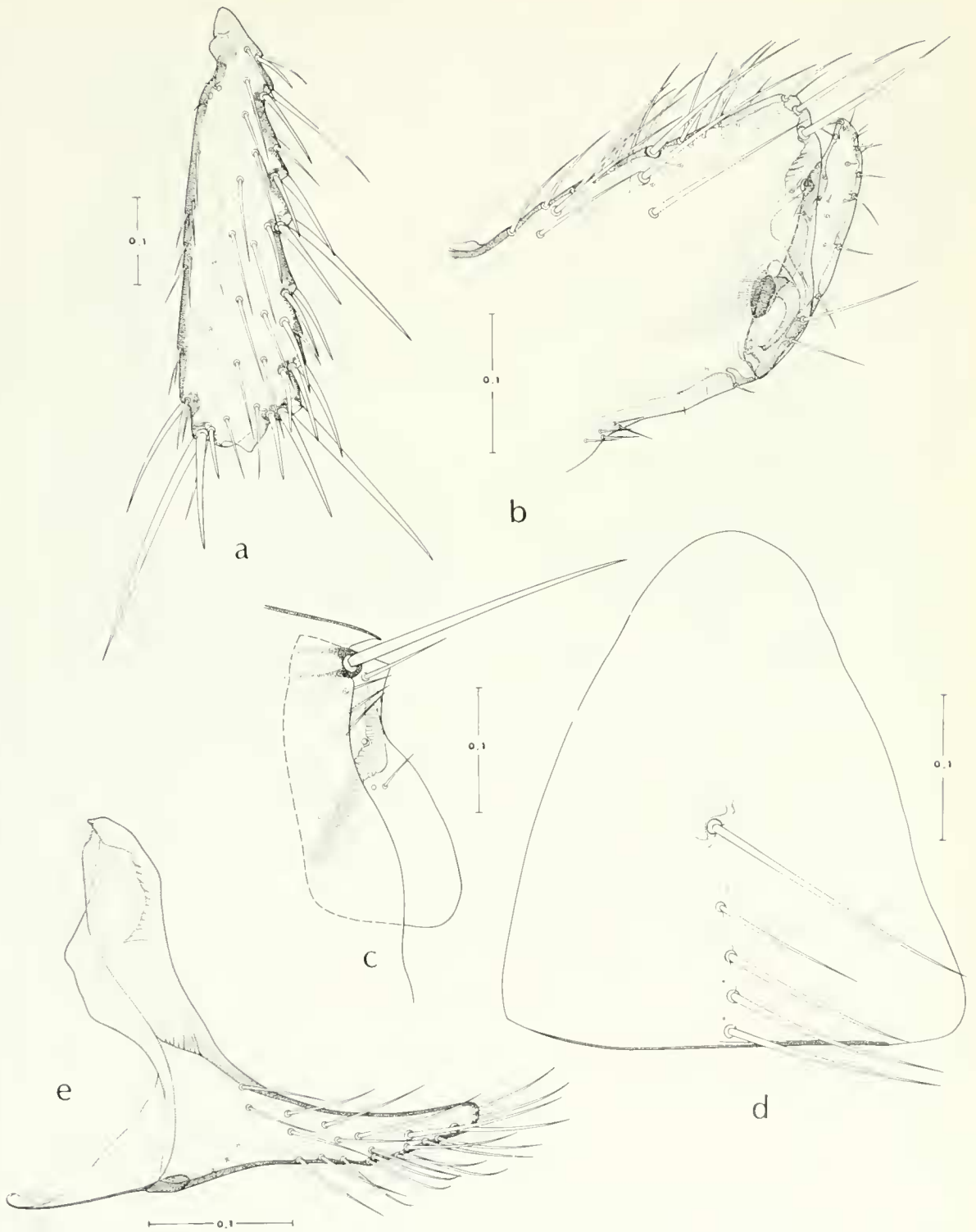


Fig. 14. *Polygenis frustratus* Johnson. Male: a, metatibia. b, process and movable finger of clasper. c, seventh and eighth abdominal terga. d, eighth sternum. e, ninth sternum.

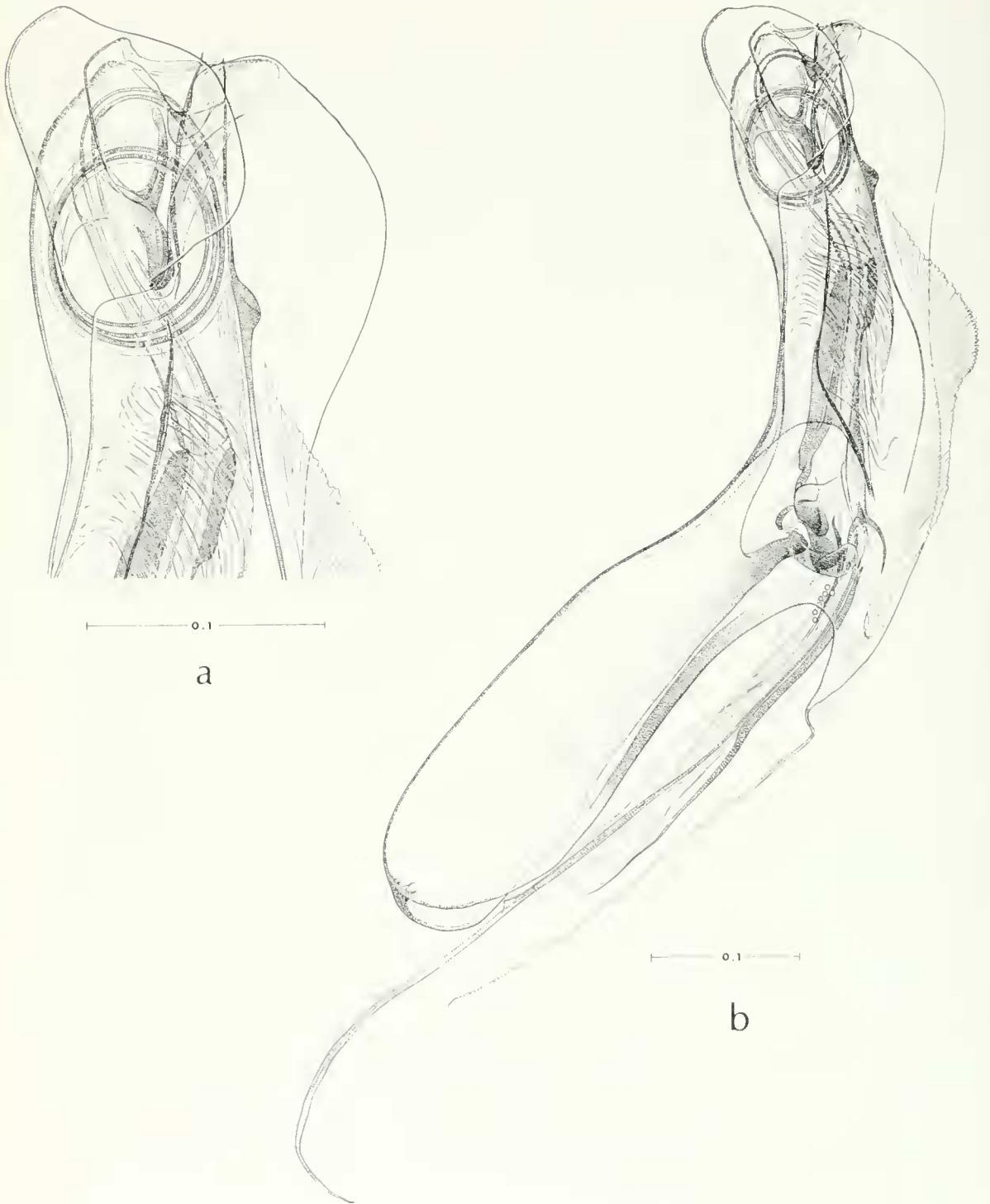


Fig. 15. *Polygenis frustratus* Johnson. Male. a, apex of aedeagus. b, aedeagus.

the genus with 6 dorsal notches on the metatibia and 3 bristles in the penultimate notch. Even though our specimens meet these criteria there are differences major enough to be at least on a subspecific level. For example, the distal arm of the ninth sternum is narrower at the base than at the apex while in *P. impavidus* the reverse is true. In the male the ventral margin of the eighth sternum is divided about half way between the apex and the row of lateral bristles; the division begins about one-fourth of the distance from the row of lateral bristles in our specimens. There are some differences in the details of the aedeagus, particularly the crochet and the distolateral lobe of the aedeagus. Assignment of these specimens to *P. impavidus* is provisional.

Polygenis klagesi klagesi (Rothschild)

Pulex klagesi Rothschild, 1904:620, Pl. 9, Fig. 28; Pl. 10, Fig. 35, 39.

Rhopalopsyllus klagesi, Baker, 1905:130,144.—Jordan and Rothschild, 1922:269.—Jordan and Rothschild, 1923b:331, 350.

Rhopalopsyllus klagesi klagesi, Jordan and Rothschild, 1923b:332, Fig. 343, 344.

Polygenis klagesi, Jordan, 1939:447.—Tipton and Mendez, 1966:298, Pl. 56, Fig. 3; Pl. 57, Fig. 5, 5a, 6, 6a, 6b.—Del Ponte, 1967:58.

Polygenis klagesi klagesi, Costa Lima and Hathaway, 1946:142. — Guimarães, 1948:139, Fig. 1h.—Cova Garcia and Tallafarro, 1959:327, 331, 346.—Johnson, 1957:163, 164.

Tiamastus (Gephyropsylla) klagesi, Barrera, 1952:187-194. — Barrera and Diaz-Ungria, 1957:184. — Machado-Allison, 1963:276. — 1966:23, 26, 32, Fig. 12.—Machado-Allison and McClure, 1963:421-436.

Type Data: A series of 12 males, 17 females, ex "spring rat" ("spiney rat"?), Venezuela Bolívar, Caura River, La Vuelta, 17-V-1903, S. M. Klages collector.

Other Recorded Distribution: Brazil: ex *Dasyppus novemcinctus*, *Metachirus opossum* (= *Philander opossum*), and "rato do mato." Colombia: ex *Proechimys cayennensis chrysaolus* (= *P. semispinosus chrysaolus*) and *Dasyprocta variegata*.

VENEZUELAN RECORDS (279 males and 339 females)

Since more than 96% of our specimens were collected from 129 specimens of *Proechimys semispinosus* and *Proechimys guyanensis* we have chosen to list records in chart form given in Table 1.

In addition there was one female each from Carabobo and Sucre on *P. semispinosus*. The remaining 24 specimens of *P. klagesi klagesi* were ex: *Agouti paca* (Zulia), *Akodon urichi* (Bolívar), *Desmodus rotundus*³ (T. F. Amazonas), *Didelphis marsupialis* (T. F. Amazonas, Bolívar, Trujillo, and Zulia), *Echimyus armatus* (Apure), *Felis pardalis* (Bolívar), *Mazama americana* (Bolívar), *Molossus ater*³ (Monagas), *Monodelphis brevicaudata* (Barinas), *Oryzomys minutus* (Táchira), *Sigmodon hispidus* (Carabobo), *Tapirus terrestris* (Apure). Bat hosts probably represent contaminations or errors in record keeping and it is possible that this may be the case for some of the other hosts as well.

REMARKS

See: *Polygenis klagesi samuelis*

Polygenis klagesi samuelis
(Jordan and Rothschild)
(Fig. 16, 17, 18, 29e)

Rhopalopsyllus klagesi samuelis Jordan and Rothschild, 1923b:331, Fig. 342, 344.

Rhopalopsyllus (Polygenis) klagesi samuelis, Ewing and Fox, 1943:22.—Anduze, Vogel-sang, and Pifano, 1947:5.

Polygenis klagesi samuelis, Costa Lima and Hathaway, 1946:142. — Barrera, 1952:187. — Traub and Johnson, 1952:128. — Johnson, 1957:164.—Cova Garcia and Tallafarro, 1959:331, 346.—Tipton and Mendez, 1966:299.—Del Ponte, 1967:59.

Tiamastus (Gephyropsylla) klagesi samuelis, Barrera 1952:187-194. — Barrera and Diaz-Ungria, 1957:164, 184. — Machado-Allison, 1962b:186. — 1963:276. — 1966:26, 32.—Machado-Allison and McClure, 1963:421-436.

Type Data: Male holotype plus paratype specimens ex *Didelphis marsupialis* and *Oryzomys laticeps* (= *O. capito*), Venezuela: San Esteban; additional specimens ex *Proechimys*

Table 1. Venezuelan Records of *Polygenis klagesi klagesi* (Rothschild) According to Host and Locality.

State or Territory	No. of Hosts		Fleas	Index
	<i>P. semispinosus</i>	Males		
T. F. Amazonas	9	18	18	4.0
Apure	51	118	160	5.45
Barinas	19	67	80	7.73
Zulia	16	18	19	2.31
Subtotal	95	221	277	5.24
<i>P. guyanensis</i>				
T. F. Amazonas	19	14	20	1.79
Bolívar	15	32	28	4.0
Subtotal	34	46	48	2.76
Total	129	267	325	4.59



Fig. 16. *Polygnis klagesi samuelis* (Jordan and Rothschild). Male: a, metatibia. b, process and movable finger of clasper. c, seventh and eighth abdominal terga. d, eighth sternum. e, ninth sternum.

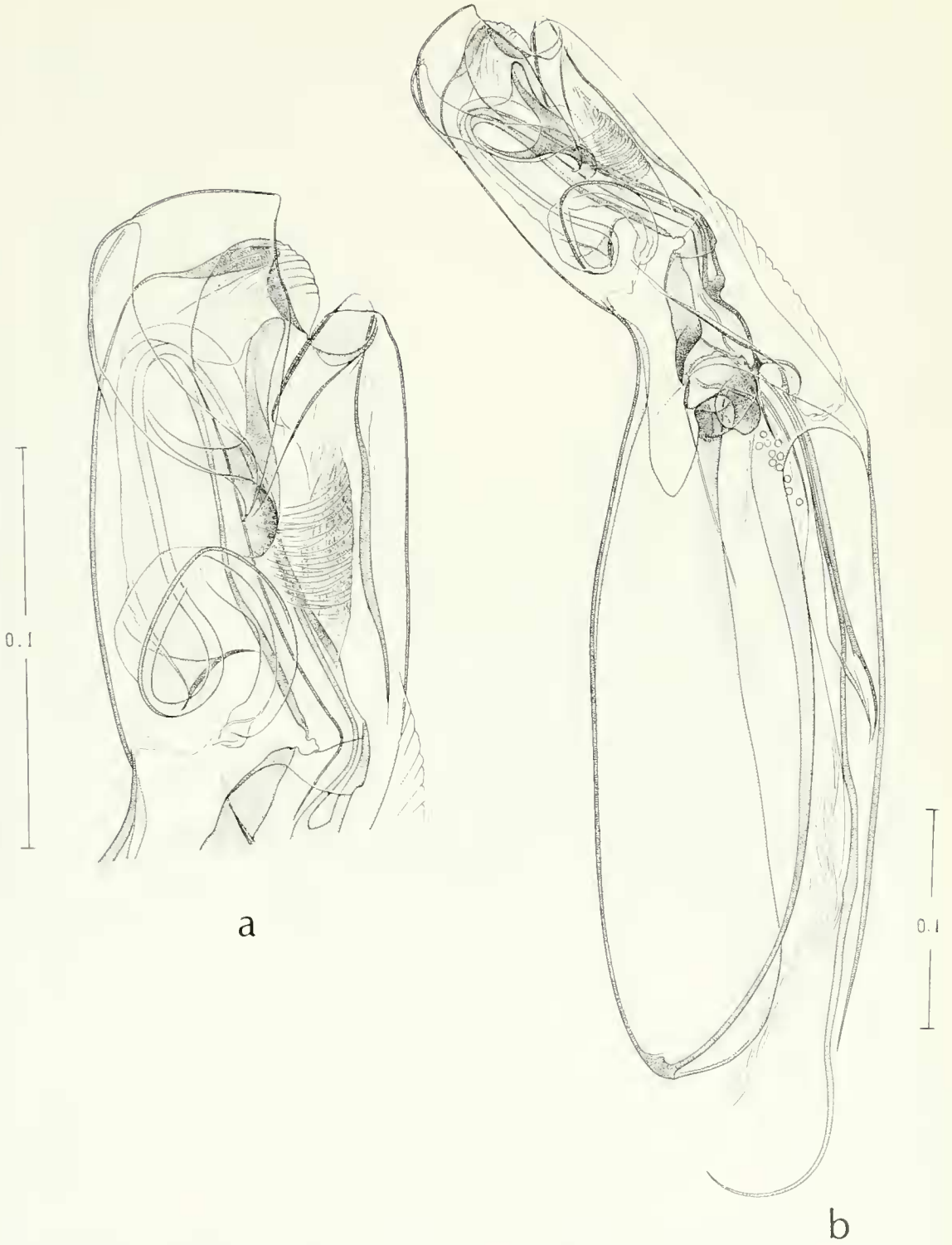


Fig. 17. *Polygenis klagesi samuelis* (Jordan and Rothschild). Male: a, apex of aedeagus. b, aedeagus.

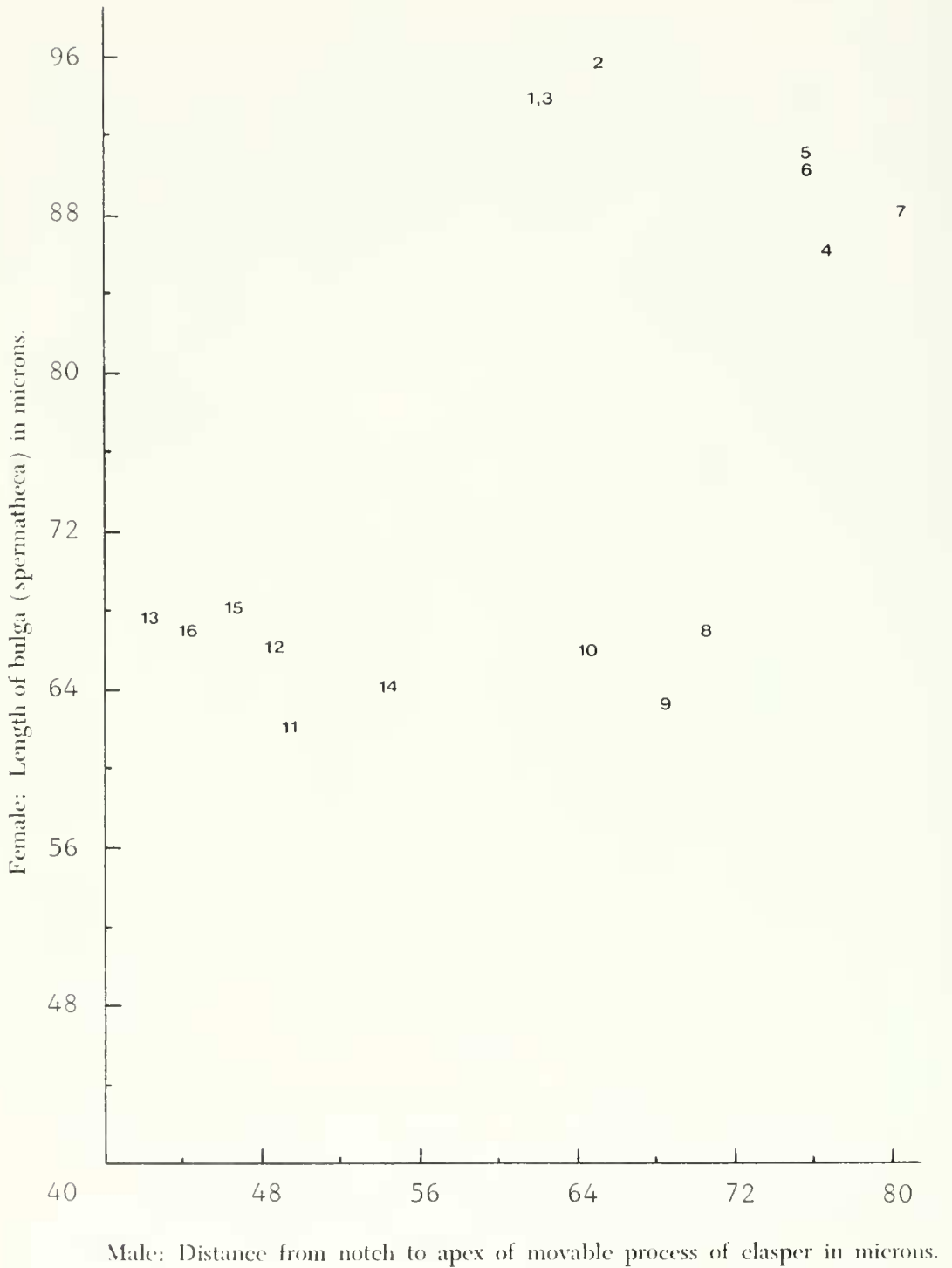


Fig. 18. Scattergraph showing relationship between *Polygenis klagesi klagesi* and *P. klagesi samuelis* based on length of bulga of the spermatheca and the distance from the notch to the apex of the movable process of the clasper.

guairae (= *P. semispinosus*), same locality. One male and 2 females ex *Felis pardalis mearnsi* and *Proechimys semispinosus panamensis*, Panama: Canal Zone, Pedro Miguel, L. II. Dunn collector.

Other Recorded Distribution: Venezuela: ex *Sciurus griseogena meridensis* (= *S. granatensis meridensis*), *Oryzomys concolor speciosus*, *Proechimys cayennensis guairae* (= *P. semispinosus guairae*), *Akodon u. urichi*, *Didelphis m. marsupialis*, *Proechimys cayennensis trinitatis* (= *P. semispinosus trinitatis*), *Rattus rattus frugivorus*.

VENEZUELAN RECORDS (353 males and 401 females)

As with *P. klagesi klagesi* most (91%) of our specimens of *P. klagesi samuelis* were collected from *Proechimys semispinosus*.

Hosts from which the remaining 61 specimens of *P. klagesi samuelis* were collected were: *Artibeus cinereus*² (Dto. Federal), *Artibeus lituratus*² (Trujillo), *Conepatus semistriatus* (Falcón), *Didelphis marsupialis* (Falcón, Lara, and Monagas), domestic horse (Falcón), *Monodelphis brevicaudata* (Barinas), *Oryzomys minutus* (Merida), *Proechimys canicollis* (Zulia), *Sigmodon hispidus* (Lara), snake² (Carabobo), *Tamandua longicaudata* (Lara), *Uroderma bilobatum*² (Falcón), *Vampyrops helleri*² (Yaracuy), and *Zygodontomys brevicauda* (Sucre).

Table 2. Venezuelan Records of *Polygenis klagesi samuelis* (Jordan and Rothschild) from *Proechimys semispinosus* According to State.

State	No. of Hosts		Fleas		Index
	<i>P. semispinosus</i>	Males	Females		
Barinas	2	0	3		1.5
Carabobo	19	44	58		5.4
Falcón	28	55	56		4.0
Guárico	4	14	32		11.5
Lara	14	106	108		15.3
Monagas	5	21	12		6.6
Sucre	14	59	54		8.1
Trujillo	10	24	27		5.1
Yaracuy	3	6	6		4.0
Zulia	3	0	3		1.0
Total	102	329	359		6.7

REMARKS

We selected 10 female specimens (fewer than 10 in 4 instances) from each of 16 localities and measured the bulga (spermatheca). The average was computed (in microns) and plotted on the Y axis (ordinate) of a scatter graph. (Fig. 15). The same procedure was followed for males except the measurements were made of the distance from the notch on the anterior margin of the movable process of the clasper to its apex. The average of these measurements was plotted on the X axis (abscissa).

Specimens from Trujillo (11. Agua Santa), Falcón (12. Mirimire), Guárico (13. San Juan),

Carabobo (14. Montalbán), Monagas (15. Caripe), and Sucre (16. Manacal) are clearly *samuelsis*. Specimens from Apure (4. Nulita), Zulia (5. Encontrados and 6. Machiques), and Barinas (7. Altamira) are clearly *klagesi*. Female specimens from Amazonas (1. Esmeralda) and Bolívar (2. Icabarú and 3. Ciudad Bolívar) fit the criteria for *klagesi* but the males are intermediate. Likewise, females from Falcón (8. Socopo), Lara (9. El Tocuyo), and Yaracuy (10. San Felipe) fit the criteria for *samuelsis* but the males are intermediate. Machado-Allison and McClure (1963) found no evidence of hybridization between the two subspecies. Their map showing the distribution of the two subspecies is substantiated by our findings. Based on female specimens along the Orinoco River appears to be the dividing line between the two subspecies in eastern Venezuela but in western Venezuela a line extending from San Felipe to El Tocuyo. thence to Socopo (in Falcón about 100 km east of Maracaibo) and then west across Lake Maracaibo and Zulia represents the area where the two subspecies meet. An exception to this is represented by a collection of 24 male and 27 female specimens of *samuelsis* from the Agua Santa area (Trujillo) which is about 100 km south of Socopo.

Our specimens were collected almost exclusively from *Proechimys semispinosus* and mostly in dry tropical forests. *Polygenis k. klagesi*, on the other hand, seems to be more closely associated with humid tropical forests. If the barrier between the two subspecies is ecological rather than geographical this may help to explain the disjunct distribution in western Venezuela.

Table 3. Measurement and Locality Data Used in Scattergraph.

Locality	Female Length of bulga in microns	Male Measurement of movable process of clasper in microns
1. T. F. Amazonas: Esmeralda	94 (10)	62 (10)
2. Bolívar: Icabarú	98 (10)	65 (10)
3. Bolívar: Ciudad Bolívar	93 (4)	62 (5)
4. Apure: Nulita	86 (10)	76 (10)
5. Zulia: Encontrados	91 (10)	75 (10)
6. Zulia: Machiques	90 (8)	75 (6)
7. Barinas: Altamira	88 (10)	80 (10)
8. Falcón: Socopo	67 (9)	71 (10)
9. Lara: El Tocuyo	63 (10)	67 (10)
10. Yaracuy: San Felipe	66 (5)	64 (5)
11. Trujillo: Agua Santa	62 (10)	49 (10)
12. Falcón: Mirimire	66 (10)	48 (10)
13. Guárico: San Juan	68 (10)	42 (10)
14. Carabobo: Montalbán	64 (10)	54 (10)
15. Monagas: Caripe	68 (10)	46 (10)
16. Sucre: Manacal	67 (10)	44 (10)

²91 - average of 10 specimens measured

Polygenis occidentalis steganus

(Jordan and Rothschild)

(Fig. 19, 20, 29b)

Rhopalopsyllus steganus Jordan and Rothschild, 1923b:338, Fig. 356.—I. Fox, 1947:117.*Polygenis steganus*, Costa Lima and Hathaway, 1946:144.—Traub and Johnson, 1952:128.—Barrera and Diaz-Ungria, 1957:164, 186.—Cova Garcia and Tallaferro, 1959:328, 331, 347.*Rhopalopsyllus (Polygenis) steganus*, Anduze, Vogelsang, and Pifano, 1947:5.*Polygenis occidentalis steganus*, Johnson, 1957:166.—Machado-Allison, 1962b:179.—1963:272, 276.—1966:26, 34, Fig. 12.—Del Ponte, 1967:60.Type Data: Holotype male ex *Sturnira lilium*, Venezuela: San Esteban, I-1911, S. M. Klages collector.Other Recorded Distribution: Trinidad: ex opossum and *Oryzomys* species (males only). Venezuela: ex *Didelphis m. marsupialis* (males only), and *Sciurus griseogena meridensis* (= *S. granatensis meridensis*).

VENEZUELAN RECORDS (9 males and 9 females)

Sixteen specimens were collected in Monagas ex 4 *Rhipidomys venustus*, 2 *Didelphis marsupialis*, 1 *Sturnira lilium*?, and 1 *Sciurus granatensis*. The remaining 2 specimens were collected from *Proechimys semispinosus* in Yaracuy and *Rhipidomys couesi* on Nueva Esparta.

REMARKS

A comparison of our male specimens with Figure 356 in Jordan and Rothschild (1923) indicates some differences. The distal arm of the ninth sternum is not quite so robust and the caudal margin of the eighth sternum is more sharply incised in our specimens. We count fewer than 20 bristles on the hind tibia (usually 18 or 19) whereas in Johnson's (1957) key there are more than 20 bristles on the hind tibia of *P. occidentalis steganus*.*Polygenis peronis* (Jordan and Rothschild)

(Fig. 21, 22, 29g)

Rhopalopsyllus peronis Jordan and Rothschild, 1923b:340, Fig. 353, 359.—I. Fox, 1947:117.*Rhopalopsyllus (Polygenis) peronis*, Anduze, Vogelsang, and Pifano, 1946:5.*Polygenis peronis*, Costa Lima and Hathaway, 1946:144. — Traub and Johnson, 1952:112, 128, 131, Fig. 5, 7, 8, 11, 15, 17.—Johnson, 1957:157, 166. — Barrera and Diaz-Ungria, 1957:164, 186.—Cova Garcia and Tallaferro,

1959:328, 331, 332, 341, 344, 346.—Machado-Allison, 1962b:183, 184.—1963:276.—1966:26, 34, Fig. 12.—Del Ponte, 1967:59.

Type Data: Three males, 2 females, ex *Heteromys melanoleucus* (= *H. anomalus*), probably collected from Venezuela or Colombia. Other Recorded Distribution: Venezuela: ex *Heteromys anomalus*, *Sigmodon hispidus hirsutus*, and *Akodon u. urichi*.

VENEZUELAN RECORDS (9 males and 7 females)

There were 14 specimens collected from *Heteromys anomalus* in Dto. Federal and Aragua. The remaining two specimens were from *Oryzomys albigularis* in Aragua, and *Vampyrops oratus*? in Miranda.

REMARKS

Our specimens key to *P. occidentalis steganus* in Johnson's (1957) key. The critical character is the position of the acetabular bristle on the posterior margin of the immovable clasper which we have found to be variable. It is slightly above the dorsal margin of the acetabulum in our specimens. The caudal margin of the eighth sternum is not as rounded in our specimens as shown by Jordan and Rothschild (1923, Fig. 359). Most of our specimens were collected from *Heteromys anomalus* and the type specimens were also collected from the same species in Colombia or Venezuela.*Polygenis roberti beebei* (I. Fox)

(Fig. 23, 24, 29c)

Pulex roberti Rothschild, 1905:479, Pl. 13, Fig. 1, 2.*Rhopalopsyllus roberti*, Jordan and Rothschild, 1923b:330.*Rhopalopsyllus beebei* I. Fox, 1947:117, 118, Fig. 2.*Polygenis roberti*, Macchiavello, 1948:17.—Guimarães, 1940:233.—1948:540, 541.*Polygenis roberti beebei*, Traub and Johnson, 1952:123-127, 131, 132, Fig. 18-28, 30.—Johnson, 1957:168. — Barrera and Diaz-Ungria, 1957:164, 185, 186.—Cova Garcia and Tallaferro, 1959:329, 331, 347.—Machado-Allison, 1963:276.—1966:26, 34, Fig. 12.—Tipton and Mendez, 1966:299, 300, Pl. 56, Fig. 2; Pl. 57, Fig. 3, 4.—Del Ponte, 1967:57.Type Data: Holotype male, ex *Didelphis marsupialis*, Venezuela: Aragua, Rancho Grande Biological Station, 1098 m elev. 3-VIII-1946, W. Beebe collector.Other Recorded Distribution: Panama: ex *Philander opossum fuscogriseus*, *Marmosa robinsoni*, *Metachinus nudicaudatus dentan-*

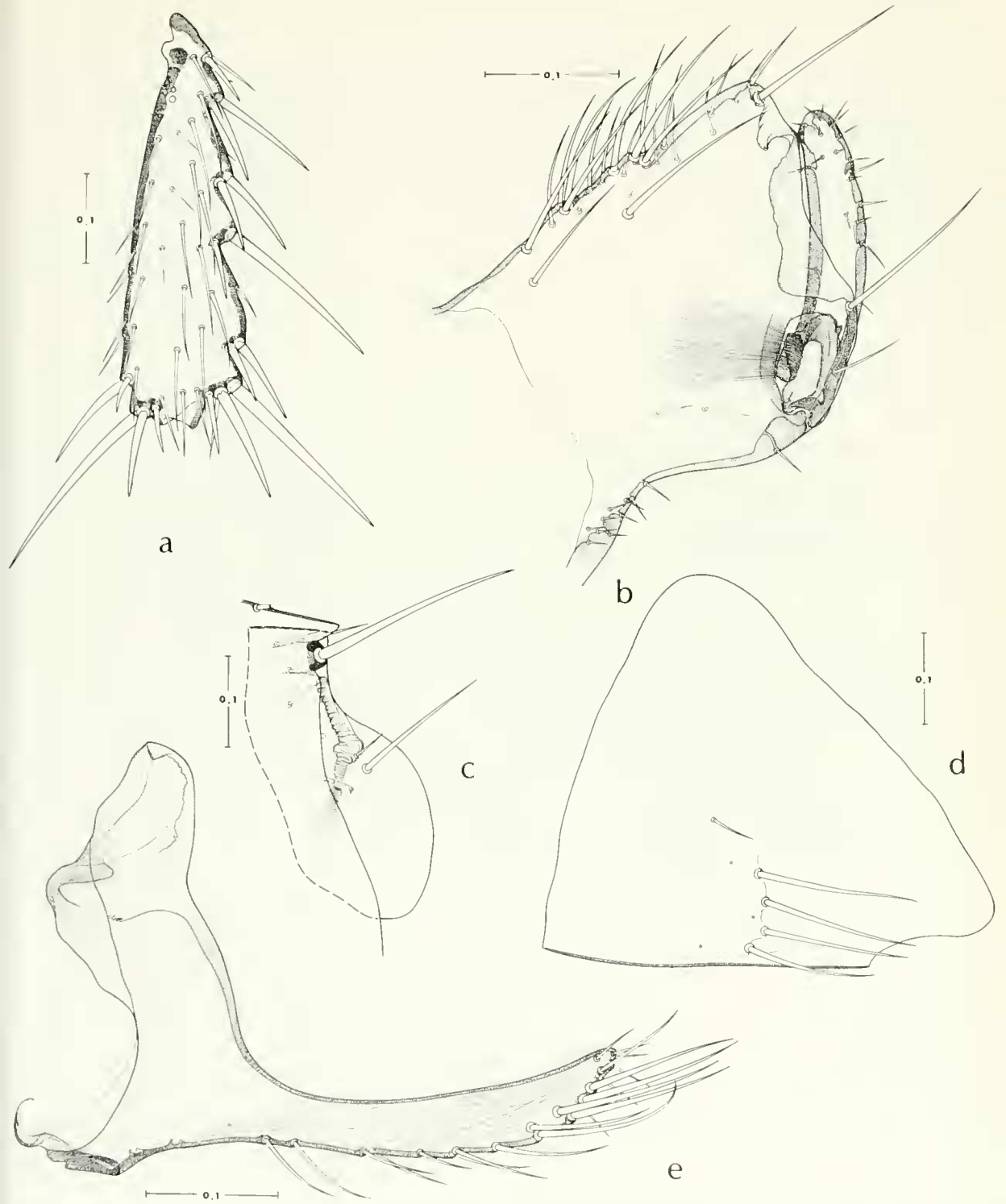


Fig. 19. *Polygenis occidentalis steganus* (Jordan and Rothschild). Male: a. metatibia. b. process and movable finger of clasper. c. seventh and eighth abdominal terga. d. eighth sternum. e. ninth sternum.

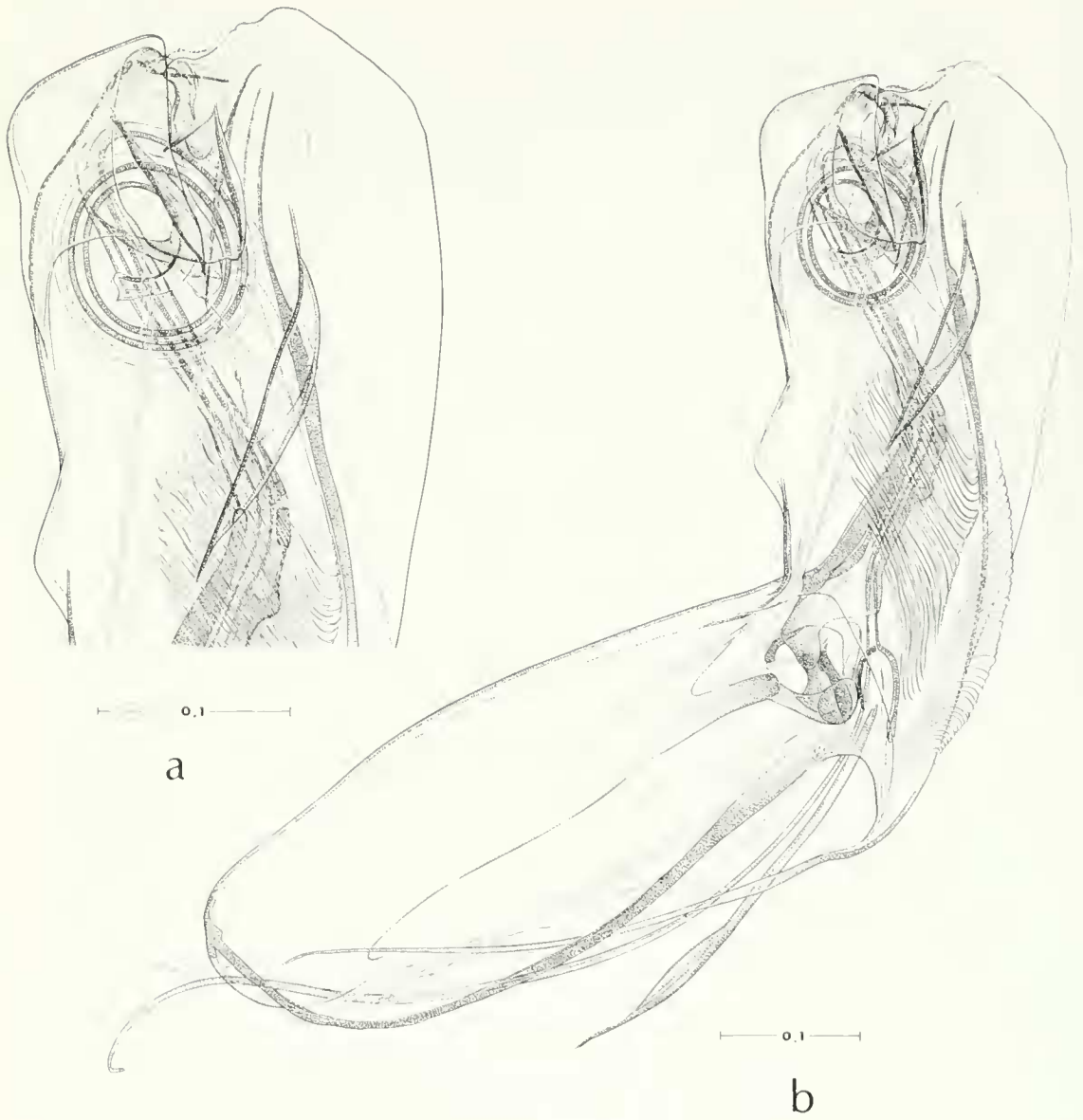


Fig. 20. *Polygenis occidentalis steganus* (Jordan and Rothschild). Male: a, apex of aedeagus. b, aedeagus.

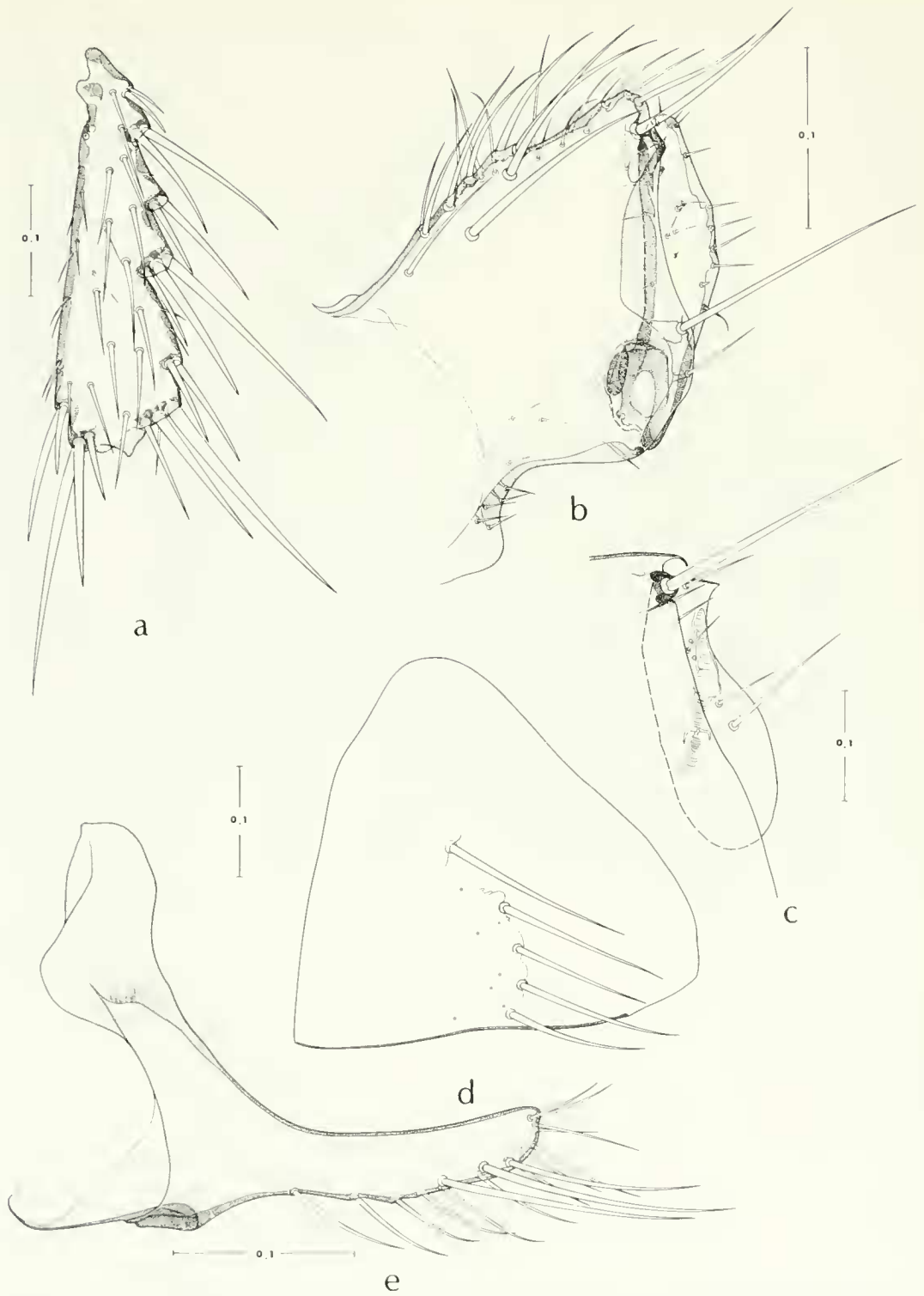


Fig. 21. *Polygenis peronis* (Jordan and Rothschild). Male: a, metatibia. b, process and movable finger of clasper. c, seventh and eighth abdominal terga. d, eighth sternum. e, ninth sternum.



Fig. 22. *Polygenis peronis* (Jordan and Rothschild). Male: a, apex of aedeagus. b, aedeagus.

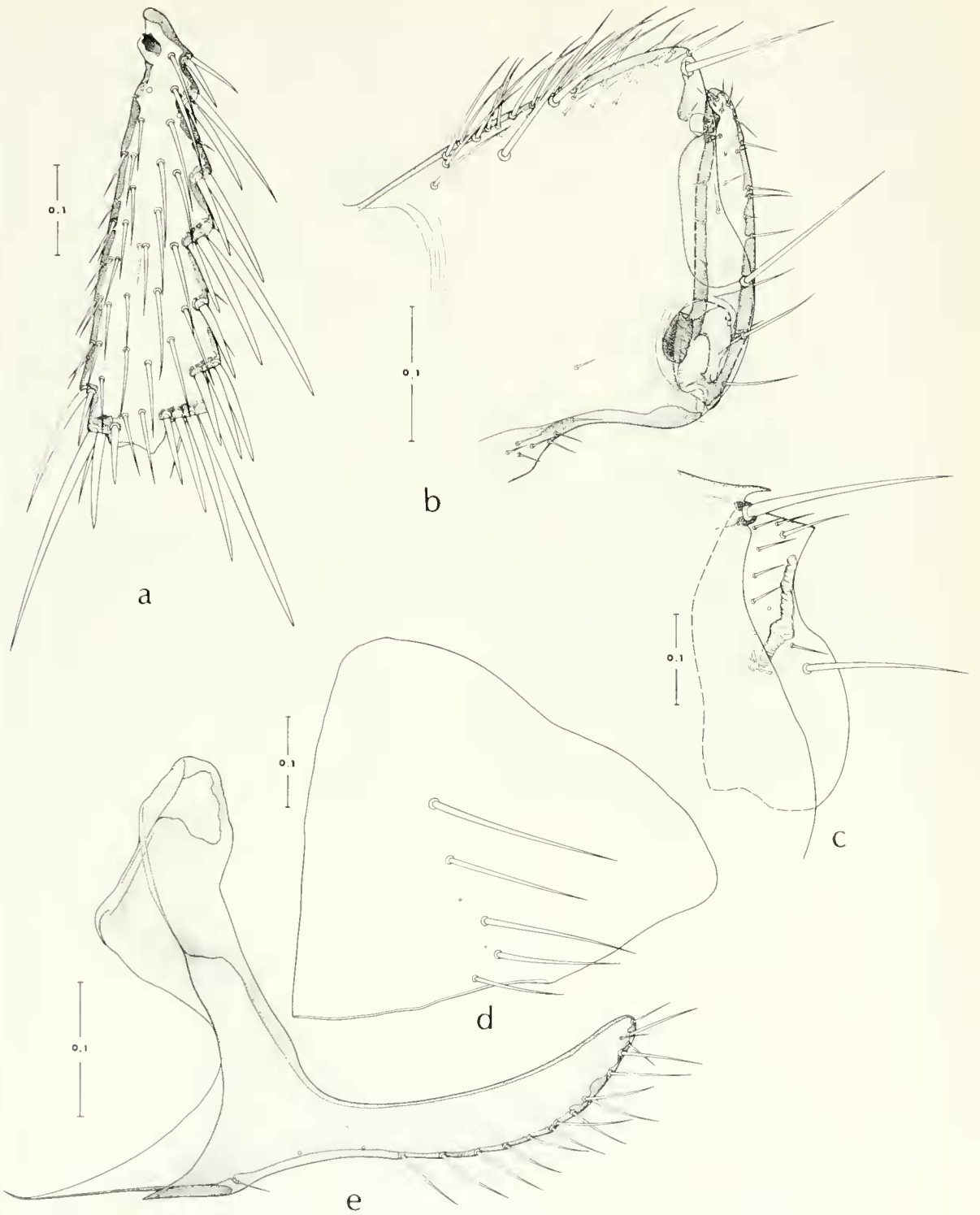


Fig. 23. *Polygenis roberti bechei* (I. Fox). Male. a, m-tatibia. b, process and movable finger of clasper. c, seventh and eighth abdominal terga. d, eighth sternum. e, ninth sternum.

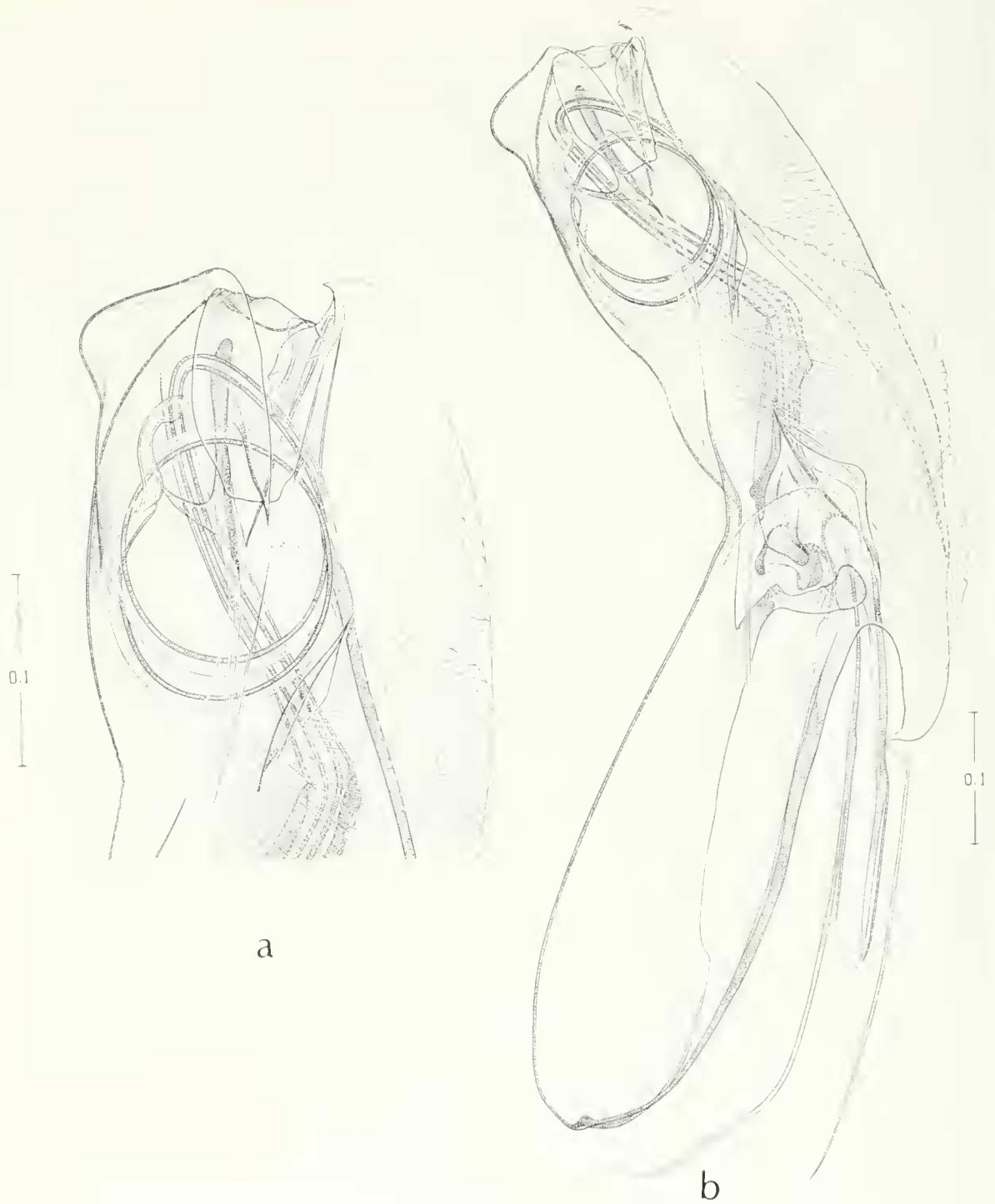


Fig. 24. *Polygenis roberti beebi* (L. Fox). Male: a, apex of aedeagus. b, aedeagus.

cus, *Didelphis marsupialis caucac*, *Heteromys desmarestianus*, *Nectomys alfari*, *Oryzomys bombycinus*, *O. caliginosus chrysomelas*, *O. capito*, *Peromyscus nudipes nudipes*, *Zygodontomys breviceauda*, and *Proechimys semispinosus panamensis*. Peru: ex *Dasypris noveboracensis*, *Oligoryzomys longicaudatus stolzmanni* (= *Oryzomys longicaudatus stolzmanni*), and *Oryzomys* (*Oryzomys*) *laticeps* (= *O. capito*) subspecies. Venezuela: ex *Didelphis m. marsupialis*, *Heteromys a. anomalus*, *Oryzomys fulvescens delicatus*, *Oecomys t. trinitus* (= *Oryzomys concolor trinitatis*), *Neacomys spinosus* subspecies (= *N. tenuipes*), *Akodon u. urichi*, *Sigmodon hispidus hirsutus*, *Rattus rattus frugivorus*, and *Mus musculus brevisrostris*.

VENEZUELAN RECORDS (114 males and 152 females)

Of the 266 specimens collected, about 61% were ex *Oryzomys* species and 17% were associated with *Didelphis marsupialis*. There were 39 males and 50 females ex 35 *Oryzomys fulvescens*, all of which were collected in Monagas except one from Sucre; 16 males and 23 females ex 14 *O. albigularis* from Aragua; 8 males and 13 females ex 6 *O. concolor* from Monagas except 1 from Zulia; 1 male and 14 females ex 3 *O. capito* from Monagas and Yaracuy; 4 males and 9 females ex 3 *Nectomys squamipes* from Monagas and Zulia; 5 males and 5 females ex 7 *Rhipidomys macconnelli* from Bolívar; 7 males and 6 females ex 3 *Zygodontomys breviceauda* from Monagas; 25 males and 20 females ex 10 *Didelphis marsupialis* from Monagas except 1 from Bolívar and 1 from Yaracuy. Other hosts include *Nectomys alfari* (Monagas), *Rhipidomys venustus* (Monagas), *Akodon urichi* (Monagas), *Oryzomys minutus* (Mérida), *Mustela frenata* (Monagas), *Molossus ater*¹ (Monagas), and bird⁴ (Mérida).

REMARKS

A large population (201 specimens) of *P. roberti beebei*, mostly ex *Oryzomys* species from Monagas, fit illustrations given by Traub and Johnson (1952). However, specimens from other localities and from other species of *Oryzomys* vary considerably in the number of notches in the hind tibia and in the number of spines in the penultimate notch of the hind tibia. In some specimens the bristles on the distal arm of the ninth sternum are longer and more numerous than in specimens from Monagas. The females of several species of *Polygenis* are morphologically similar and so it is difficult to insure that all of the females of this series are actually *P. roberti beebei*.

Polygenis versuta Guimarães
(Fig. 25, 26, 27, 28, 29a)

Polygenis versuta Guimarães, 1942:197, Fig. 1-3.

Polygenis platensis versutus, Johnson, 1957:167.

Polygenis versuta, Machado-Allison, 1962a:23-24, Fig. 1-3.

Type Data. Holotype female ex "rato do mato," Brazil: State of Bahia, Villa Nova, 1908, E. Garbe collector. Subsequent description of male based on male ex *Proechimys albispinus*, Brazil: State of Bahia: In addition, 10 males and 15 females with same data. One female ex *Rhipidomys cearanus* (= *R. mastacalis cearanus*), Brazil: State of Pernambuco. Other Recorded Distribution: None.

VENEZUELAN RECORDS (8 males and 15 females)

Nineteen specimens were collected ex 9 *Rhipidomys macconnelli* in Bolívar, and T. F. Amazonas. The remaining specimens (1 each) ex *Marmosa murina* in Bolívar, *Didelphis azarae* and *Akodon urichi* in T. F. Amazonas.

REMARKS

There are three distinct populations represented in our collections, all of them except 3 females were collected from *Rhipidomys macconnelli*. They may be subspecies of *P. versuta* or they may be undescribed species in the *occidentalis-peronis-versuta* complex. One male (SVP 8550) (Fig. 25-26) from Bolívar differs from males in the other two populations in that the distal arm of the ninth sternum is broad in the middle and has no setae on the proximal half, the movable process of the elasper is somewhat shorter and broader and the details of the aedeagus differ, principally the crochet. The second population of 2 males and 2 females (SVP 8049, 8869) (Fig. 27-28) from Bolívar is like the first male except the distal arm of the ninth sternum is not broad in the middle and it tapers from base to apex, the movable process of the elasper is long and narrow and again the details of the aedeagus differ. The third population, composed of 5 males and 12 females, is entirely from T. F. Amazonas and all ex *Rhipidomys macconnelli* except 3 females. In this population the distal arm of the ninth sternum is somewhat intermediate between the other two in shape but there are no bristles on the proximal half, the eighth sternum is much more rounded apically than in the other two groups, the movable process of the elasper is intermediate between the two groups, and again there are some differences in the details of the aedeagus.

Family Pygiopsyllidae

Genus *Ctenidiosomus* Jordan

Ctenidiosomus Jordan, 1931a:311

Type Species of genus: *Ctenidiosomus spillmanni* Jordan, 1931.



Fig. 25. *Polygenis versuta* Guimaraes. Male (SVP 8850): a, metatibia. b, process and movable finger of clasper. c, seventh and eighth abdominal terga. d, eighth sternum. e, ninth sternum.

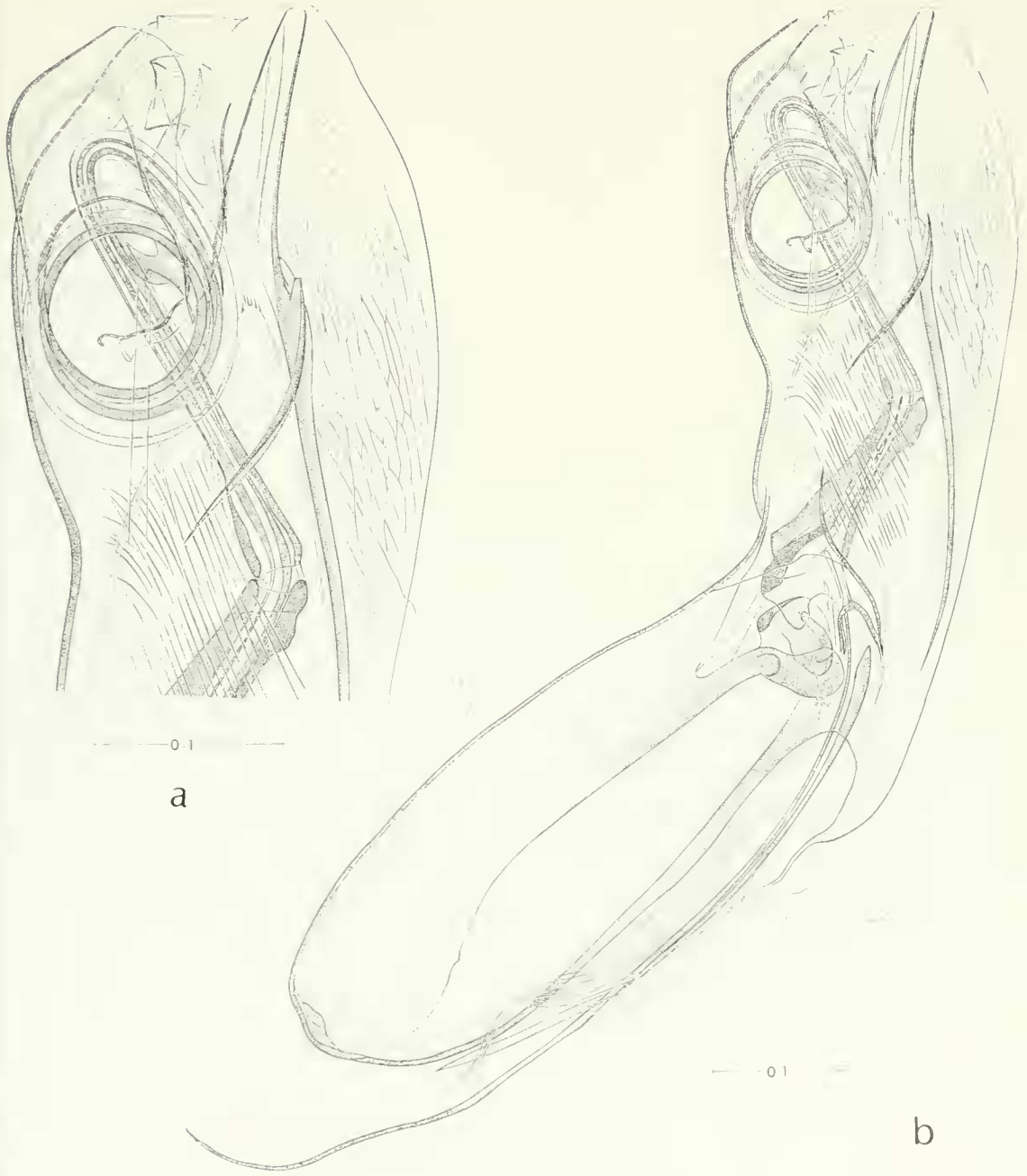


Fig. 26. *Polygenis versuta* Guimarães. Male (SVP 8550): a, apex of aedeagus. b, aedeagus.

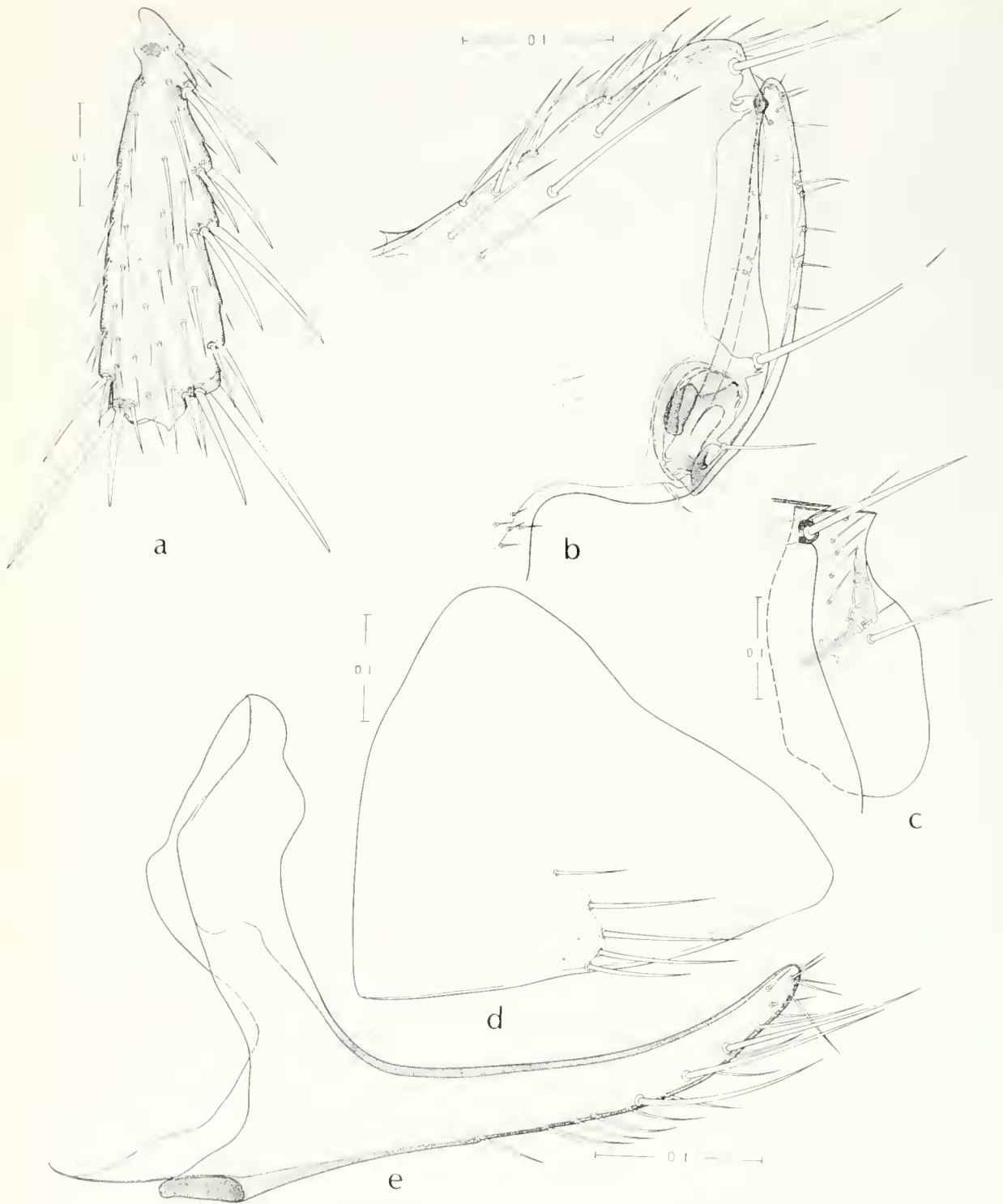


Fig. 27. *Polygenis versuta* Guimarães. Male (SVP 8669): a, metatibia. b, process and movable finger of clasper. c, seventh and eighth abdominal terga. d, eighth sternum. e, ninth sternum.

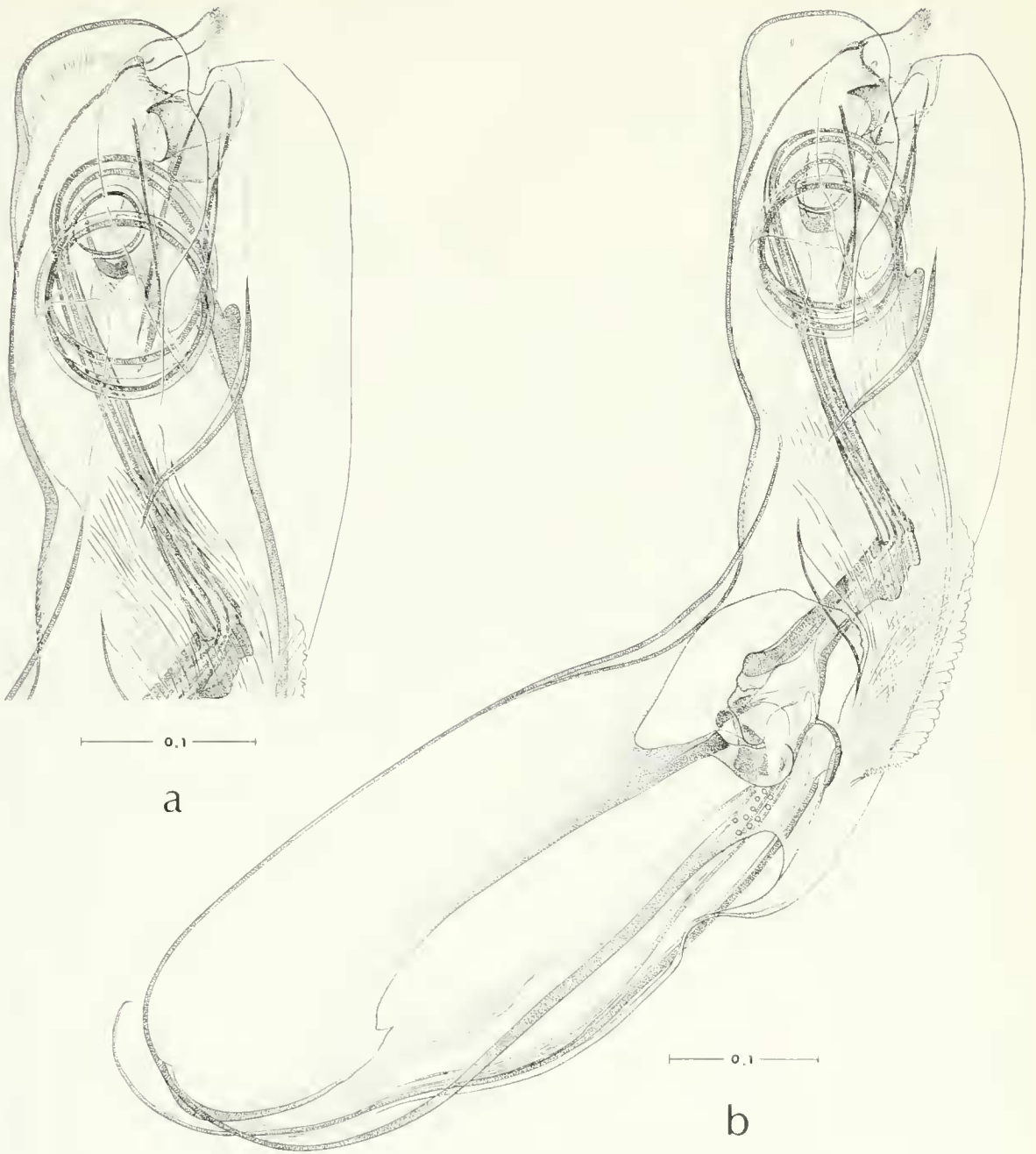


Fig. 28. *Polygenis versuta* Guimarães. Male (SVP 8669): a. apex of aedeagus. b. aedeagus.

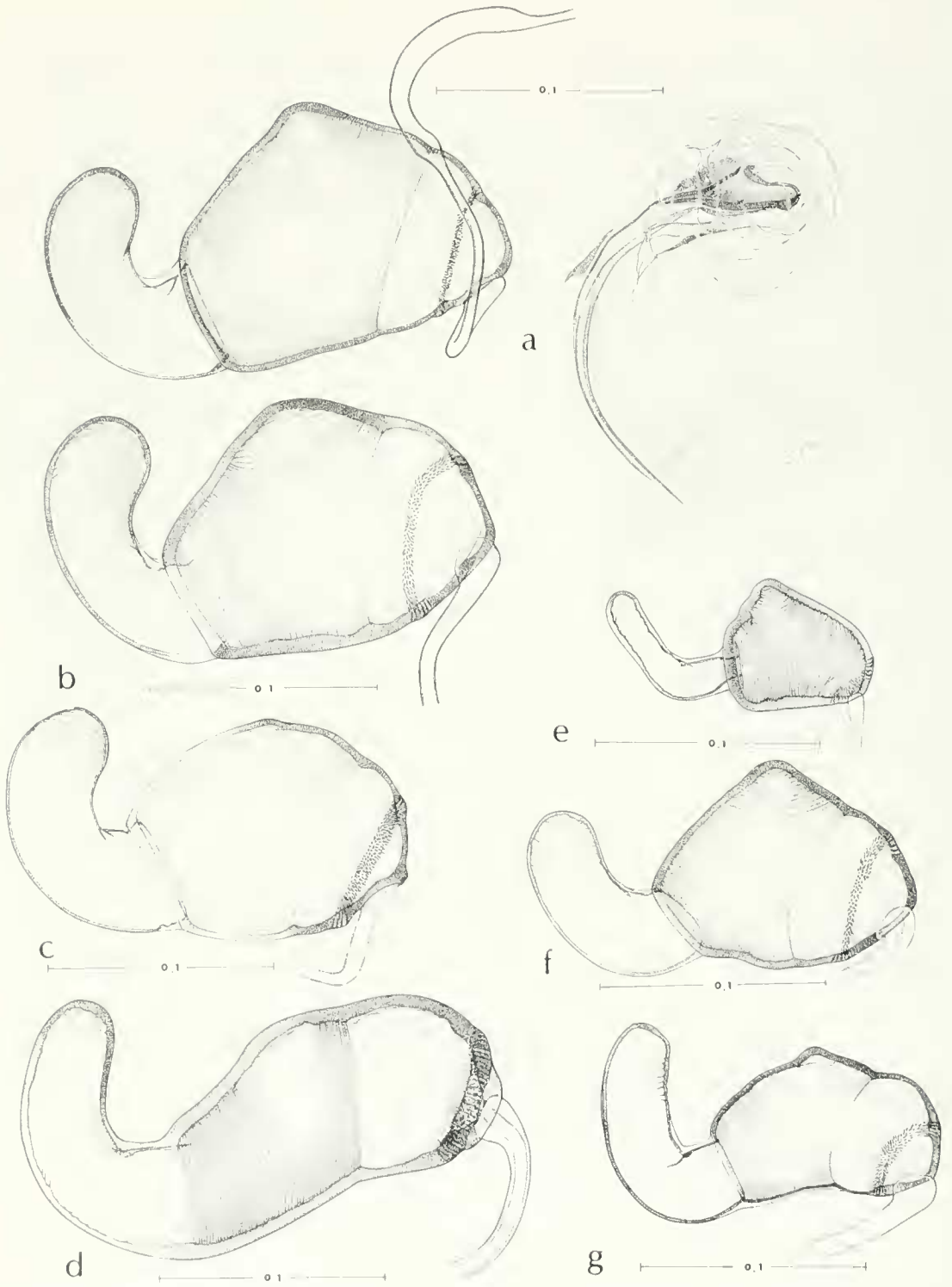


Fig. 29. Females: a *Polygenis tersuta*, spermatheca and bursa copulatrix. Spermathecae of other *Polygenis* species and subspecies: b, *P. occidentalis steganus*. c, *P. roberti bechei*. d, *P. frustratus*. e, *P. klagesi samuelis*. f, *P. bohlsi bohlsi*. g, *P. peronis*.

Ctenidiosomus perplexus, new species

(Fig. 30-33)

DIAGNOSIS

Very near *Ctenidiosomus rex* Johnson, 1957, but may be separated from that species by a combination of the following characters. In the male the distal arm of the ninth sternum is subtruncate, not rounded, and more setose than in *C. rex*. The apex of the proximal arm of the ninth sternum is broadly triangular rather than fingerlike; the median dorsal lobe is shaped like the head of a bird as in *C. rex* but the beak is not so pointed; the crochet is curved dorsad rather than ventrad; the apex of the process of the clasper is globular not angular; the apex of the aedeagal apodeme is not curved dorsad so far as in *C. rex* and the penis rods are more highly coiled.

DESCRIPTION

Head (Fig. 30a): Fracticipit. Frontoclypeal margin evenly rounded. Preantennal area with three submarginal discs; micropunctations scattered over surface; first row of 6 medium bristles, first bristle displaced; second row of 3 long bristles which reach beyond caudoventral margin of gena; several small setae in ocular area. Caudoventral margin of gena concave, producing two lobes. Eye reduced, lightly pigmented. Occiput with two submarginal discs plus 1 lateral disc, micropunctations scattered over surface of anterior portion; 3 rows of bristles arranged 4(5)-5(6)-7; with additional very long bristle in caudoventral angle (bristles of first row broken off in male holotype); many small setae scattered along margin of antennal fossa.

Thorax (Fig. 30a, b): Pronotum with anterior row of 9 or 10 medium bristles; second row of about 9 longer bristles, with intercalaries between bases of bristles of second row. Pronotal comb of 13 or 14 spines per side; mesonotum with 3 more or less distinct rows of bristles with several small bristles anterad of these rows. Mesepisternum with 2 or 3 small bristles in posteroventral angle, 2 small bristles and 1 long bristle near ventral margin. Metanotum with 3 distinct rows of bristles caudad of several smaller bristles scattered over surface. Lateral metanotal area with single large apicodorsal bristle. Metepisternum with row of 5 bristles, middle 3 bristles long, dorsal-most bristle small, ventral bristle of medium length. Metepimere with 2 rows of bristles, first row of 6 medium bristles plus smaller displaced bristle dorsad of row, small bristle between first and second bristles; second row of 8 or 9 bristles, interspersed with 3 to 4 smaller bristles.

Legs: Mesocoxa with external swordlike ridge extending ventrad to external oblique break. Metatibia with bristles in dorsal notches from base to apex as follows: 2-2-2-2-2-4-3.

Abdomen: Female with well-developed combs on terga II to VI (1 female with combs on terga II to VII); number of teeth in each comb highly variable but most frequently 15-14-14(15)-11(12)-8. Male with combs on terga II to V. Two large antepygidial bristles, ventral bristle longer than dorsal bristle; in female 2 large bristles ventrad of antepygidial bristles.

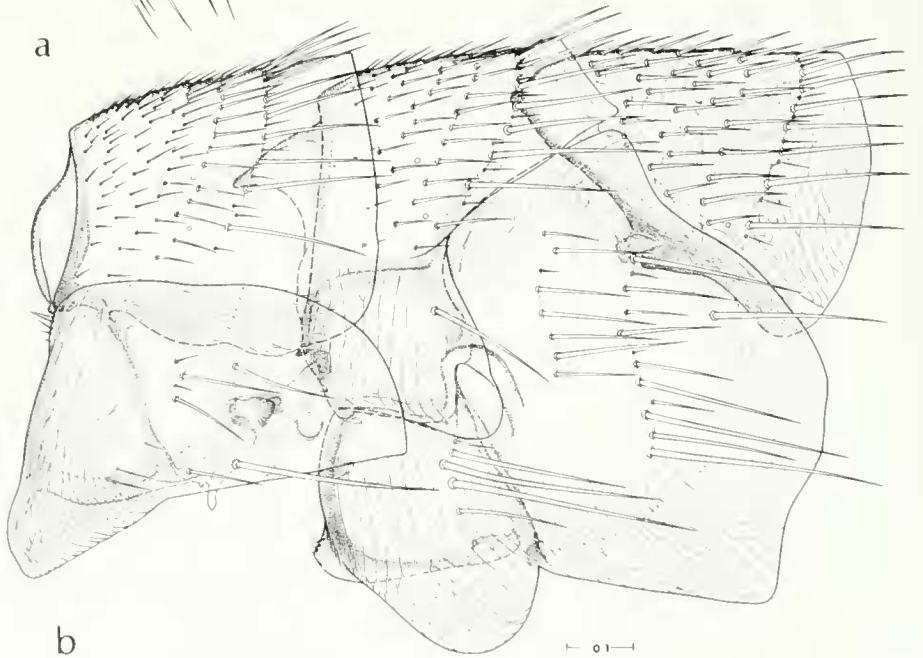
Modified Abdominal Segments, Male (Fig. 31): Eighth sternum with caudal margin subtruncate; 6 to 8 large, dark submarginal bristles plus several additional submarginal and lateral bristles. Manubrium with base hamlike, apex fingerlike. Immobile process of clasper with sinus in caudodorsal margin; anterior lobe with parallel sides, apex rounded; with 3 long lateral bristles plus several smaller marginal and submarginal bristles; caudal lobe with evenly rounded posterior margin bearing 4 stout evenly spaced bristles. Movable process of clasper with subparallel sides gradually tapering to subacuminate apex; 2 long subapical bristles on posterior margin; several smaller bristles ventrad of two larger bristles; lateral vertical row of 5 or 6 smaller bristles; several small lateral and submarginal bristles on anterodorsal portion. Proximal arm of ninth sternum swollen subapically, apex triangular. Distal arm of ninth sternum with subparallel sides but with apex slightly wider than base; apex subtruncate; caudal margin with 4 strong dark bristles, 2 on apex close together, others more widely separated; with numerous additional smaller marginal, submarginal and lateral bristles primarily on caudal half of distal arm of ninth sternum.

Aedeagus (Fig. 32): Aedeagal spodeme long and narrow, apex acuminate, slightly upturned. Median dorsal lobe evenly rounded dorsally, with apicocaudal projection beaklike. Lateral lobes striate to reticulate; apex subtruncate to subacuminate. Crochets narrow, curved dorsad. Aedeagal apodemal rod extends beyond apex of apodeme but not coiled. Penis rods highly coiled, fimbriate for almost entire length.

Modified Abdominal Segments, Female: Seventh sternum with prominent narrow sinus dividing caudal margin into 2 subequal lobes. Eighth tergum with 11-15 bristles proximad of these; margin well sclerotized. Anal stylet 6 times longer than wide. Spermatheca with no line of demarcation between bulga and hilla; bulga ovoid, reticulate.



a



b

Fig. 30. *Ctenidiosomus perplexus*, new species. Male: a, head prothorax and procoxa. b, meso- and meta-thorax and first abdominal segment.



Fig. 31. *Ctenidiosomus perplexus*, new species. Male: a, process and movable finger of clasper. b, ninth sternum. c, eighth sternum.

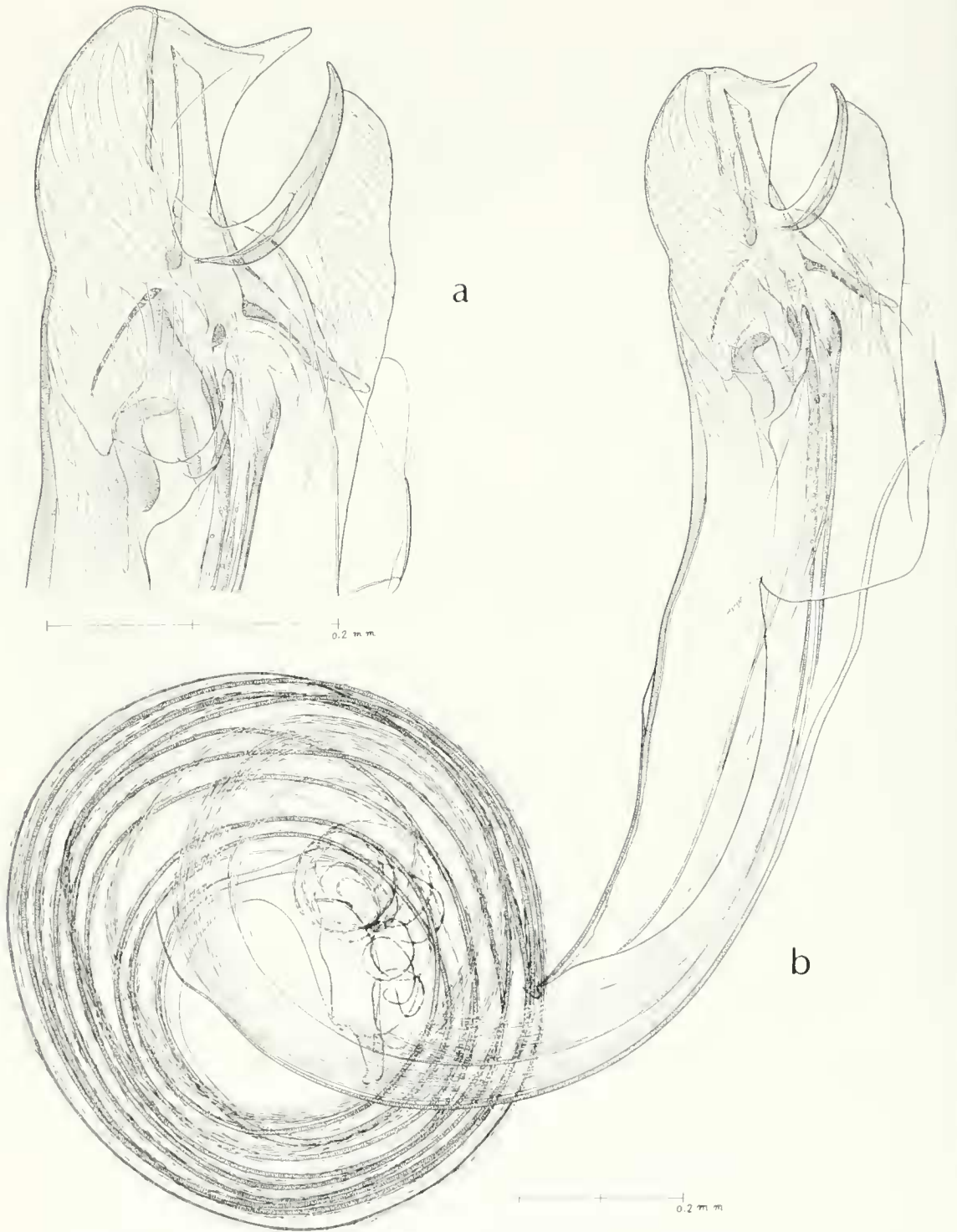


Fig. 32. *Tenediosomus perplexus*, new species. Male: a. apex of aedeagus. b. aedeagus.

Type Data: Male holotype and female allotype ex *Rhipidomys venustus* (SVP 3885), Venezuela: Trujillo, 14 km E Trujillo near Misísí, 2210 m elev., 26-I-1966, Peterson team collectors. One paratype male with same data as holotype. Ten paratype males and 10 paratype females with data given in Table 4. Male holotype and female allotype deposited in the collection of the U.S. National Museum. One male and 1 female paratype deposited in each of the following collections: British Museum, Robert Traub, the senior and junior authors.

Family Hystrichopsyllidae

Genus *Adoratopsylla* Ewing

Adoratopsylla Ewing, 1925:44.

Type Species: *Adoratopsylla bisetosa* Ewing.

Adoratopsylla (*Adoratopsylla*)
antiquorum antiquorum (Rothschild)

Ctenophthalmus antiquorum Rothschild, 1904: 643-645, Pl. 14, Fig. 72; Pl. 15, Fig. 80, 82.

Adoratopsylla antiquorum, Ewing, 1925:44.

Adoratopsylla antiquorum antiquorum, Jordan, 1938b:165, Fig. 109, 110.—Costa Lima and Hathaway, 1946:228.—Guimarães, 1954:510, 512, 513.—Johnson, 1957:31, Pl. 13, Pl. 14, Fig. 1, 2, 3.—Barrera and Diaz-Ungria, 1957: 165, 178. —Machado-Allison, 1963:270-271.—1964:158-167.—1966:24.

Type Data: Three males and 1 female ex *Di-*

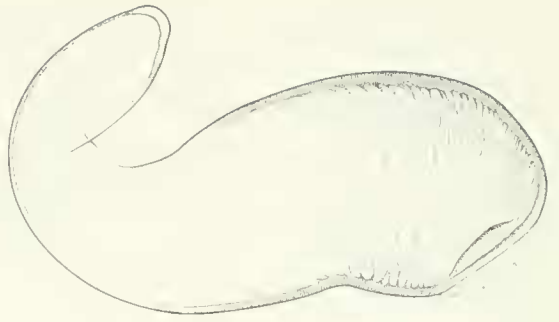


Fig. 33. *Ctenidiosomus perplexus*, new species. Female: spermatheca.

delphis aurita (= *Didelphis marsupialis aurita*), Brazil: Tigneti Zech, 1897, Ihering collector.

Other Recorded Distribution: Brazil ex *Didelphis marsupialis aurita*, *Marmosa* species, *Monodelphis domestica*, *Peromys dimidiata* (= *Monodelphis dimidiata*). Venezuela: *Monodelphis brevicaudata*.

REMARKS

Adoratopsylla antiquorum antiquorum (Rothschild) has been recorded from Venezuela by Barrera and Diaz-Ungria (1957) and Machado-Allison (1964). It is our opinion that this subspecies has not been collected in Venezuela and that specimens heretofore called *A. antiquorum antiquorum* are actually *A. antiquorum*

Table 4 Host and Locality Data for Type Specimens of *Ctenidiosomus perplexus*, New Species.

Males	Females	SVP Number	Host	Locality	Elevation in meters
1		3839	<i>Thomasomys laniger</i>	Trujillo: Hda. Misísí	2210
	1	3857	<i>Rhipidomys venustus</i>	Trujillo: Hda. Misísí	2210
1	1	3874	<i>Thomasomys laniger</i>	Trujillo: Hda. Misísí	2360
1		3876	<i>Thomasomys laniger</i>	Trujillo: Hda. Misísí	2360
1		3882	<i>Rhipidomys venustus</i>	Trujillo: Hda. Misísí	2210
2	1	3885	<i>Rhipidomys venustus</i>	Trujillo: Hda. Misísí	2210
	1	3890	<i>Rhipidomys venustus</i>	Trujillo: Hda. Misísí	2210
1		4044	<i>Thomasomys laniger</i>	Mérida: La Coromoto	3170
1		4370	<i>Rhipidomys venustus</i>	Mérida: nr Middle Refugio	2550
1		4553	<i>Thomasomys lugens</i>	Mérida: nr. Santa Rosa	2040
	1	21832	<i>Thomasomys hylophilus</i>	Táchira: Buena Vista	2395
	1	21844	<i>Thomasomys hylophilus</i>	Táchira: Buena Vista	2390
	1	21873	<i>Thomasomys hylophilus</i>	Táchira: Buena Vista	2400
1		21880	<i>Thomasomys hylophilus</i>	Táchira: Buena Vista	2405
	2	21928	<i>Oryzomys albigularis</i>	Táchira: Buena Vista	2415
	1	21935	<i>Thomasomys hylophilus</i>	Táchira: Buena Vista	2400
1		21954	<i>Thomasomys hylophilus</i>	Táchira: Buena Vista	2400
	1	21973	<i>Anotomys trichotis</i>	Táchira: Buena Vista	2400
1		21994	<i>Oryzomys minutus</i>	Táchira: Buena Vista	2400

discreta. Hopkins and Rothschild (1957) refer to an undescribed subspecies of *A. antiquorum* from Venezuela in their key to species and subspecies of the subgenus *Adoratopsylla*. Some records of *A. antiquorum antiquorum* may be this subspecies. We have a series of specimens, most of which are from Falcón, which key out to the undescribed species. A description of this subspecies is given below. Two additional male specimens, unlike any other population of *A. antiquorum*, are also described below. We have described only the modified abdominal segments since characters of the head and thorax are similar in all subspecies of *A. antiquorum*.

Adoratopsylla (Adoratopsylla)
antiquorum discreta (Jordan)
(Fig. 34-36)

Doratopsylla antiquorum discreta Jordan, 1926: 392, Fig. 18.

Adoratopsylla antiquorum discreta, Jordan, 1938b:165.—Guimarães, 1954:513.—Johnson, 1957:31.

Type Data: Male holotype and male paratype ex *Peromyscus adustus* (= *Monodelphis adusta*); Colombia: Cundinamarca, 1912.

Other Recorded Distribution: None.

DESCRIPTION

Female (Fig. 35d). *Modified Abdominal Segments*: Seventh sternum with sinus in caudal margin broadly v-shaped. Spermatheca with portion of bulga nearest hilla narrowest, striated; hilla short, broad, without striations; duct of spermatheca convoluted; bursa copulatrix well defined, perula dipperlike.

VENEZUELAN RECORDS (32 males and 40 females)

There were 66 specimens ex 7 *Monodelphis brevicaudata* in Gúarico and Barinas, and 2 female specimens ex *Akodon urichi* in T. F. Amazonas. The remaining 4 specimens were from *Proechimys guyanensis*, *Didelphis azarae* and *Rhipidomys macconnelli* in T. F. Amazonas and *Sigmodon hispidus* in Barinas.

Adoratopsylla (Adoratopsylla) antiquorum rara,
new subspecies
(Fig. 37-39)

DIAGNOSIS

Adoratopsylla antiquorum rara is distinct from other subspecies in that there is a broad deep sinus in the apicodorsal margin of the process of the clasper, producing 2 prominent lobes and the hood of the aedeagus is broadly rounded apically.

DESCRIPTION

Male (Fig. 38). *Modified Abdominal Seg-*

ments: Eighth sternum with slightly sinuate caudal margin; patch of 5 setae near ventral margin, 2 caudal-most setae largest. Distal arm of the ninth sternum with sides parallel, 3-4 apical setae, proximal arm longer than distal arm, with margin sinuate. Immovable process of clasper divided into 2 prominent lobes by broad deep sinus in apicodorsal margin; lobe 1 with 2 strong apical setae plus 3 smaller subapical setae; lobe 2 thumblike, void of setae. Movable process of clasper broad, widest at middle, reaches for half its length beyond apices of lobes of immovable process, 2 prominent setae on caudal margin near middle, 4 or 5 small setae near anterior margin plus 2 or 3 small subapical setae.

Aedeagus (Fig. 39): Aedeagal apodeme broad, apex rounded; penis rods longer than aedeagal apodeme but not coiled. Apex of hood of aedeagus broadly rounded. Crochet angular, well sclerotized.

Type Data: Male holotype ex *Marmosa murina* (SVP 8958), Venezuela: Bolívar, 59 km SE El Dorado, 1032 m elev., 2-VI-1966, Tuttle team collectors. One male paratype with same data as above.

Adoratopsylla (Adoratopsylla)
antiquorum recta, new subspecies
(Fig. 40-42)

DIAGNOSIS

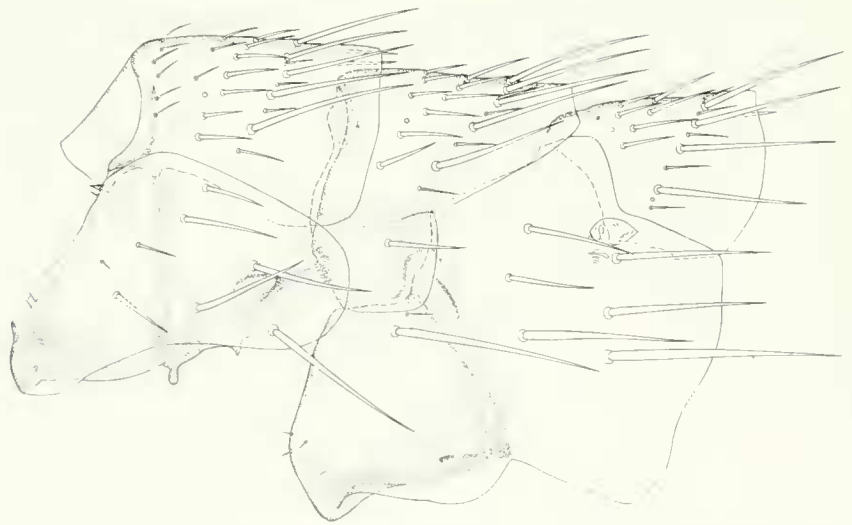
Adoratopsylla antiquorum recta, new subspecies, may be distinguished from other subspecies of *A. antiquorum* in that the apicodorsal margin of the process of the clasper is straight whereas other subspecies have a definite sinus in this margin. The hood of the aedeagus is straight and fingerlike while the apex is somewhat beaklike in *A. a. discreta* and the hood is very broad and the apex rounded in *A. a. rara*, new subspecies.

DESCRIPTION

Male (Fig. 41a, b, c). *Modified Abdominal Segments*: Eighth sternum with caudal margin essentially straight, with one small seta, one medium seta near ventral margin plus one large medial seta. Distal arm of ninth sternum narrow in middle, slightly swollen apex with 3 setae. Immovable process of clasper with apicodorsal margin straight, with one large apical seta plus similar subapical seta, two smaller subapical setae, 4 or 5 minute setae in caudoventral angle. Movable process of clasper broadest near middle, two marginal setae slightly below middle, apex subacuminate, several small subapical setae plus 2 similar medial setae.



a



S shubata

b

Fig. 34. *Adoratopsylla antiquorum discreta* (Jordan). Male: a, head, prothorax and procoxa. b, meso- and metathorax and first abdominal segment.

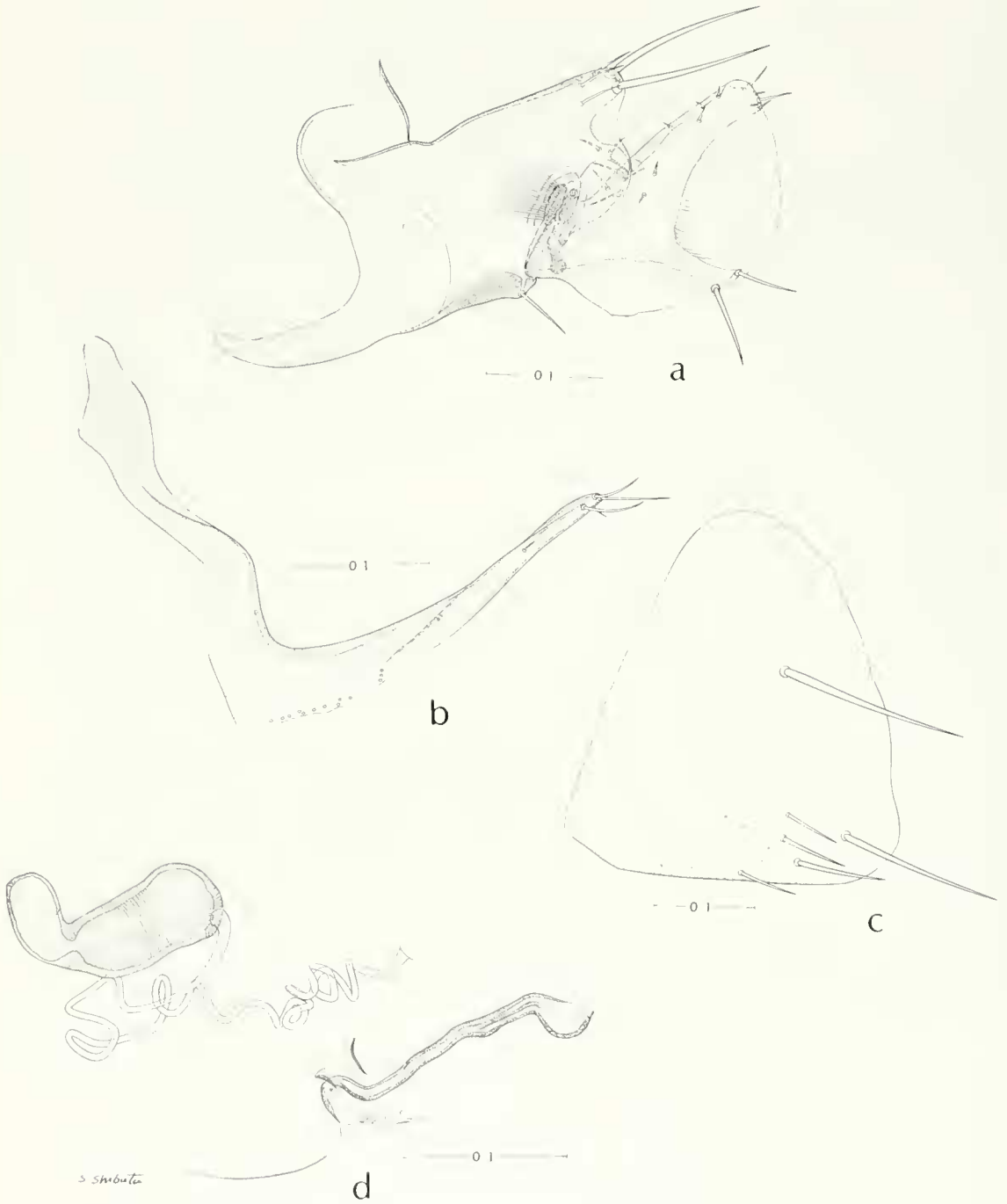


Fig. 35. *Adoratopsylla antiquorum discreta* (Jordan). Male: a, process and movable finger of clasper. b, ninth sternum. c, eighth sternum. Female: d, spermatheca, duct of spermatheca and bursa copulatrix.

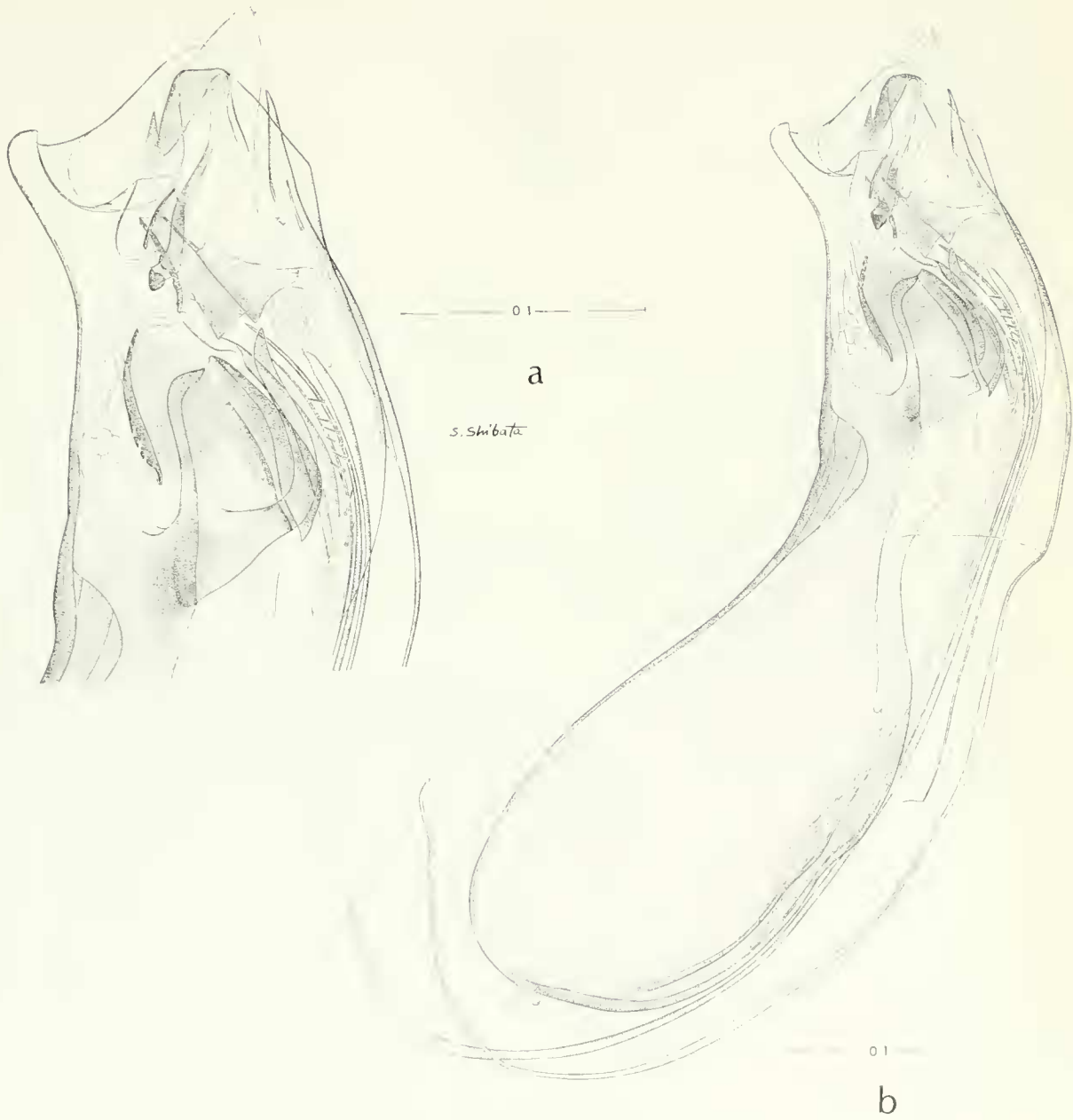
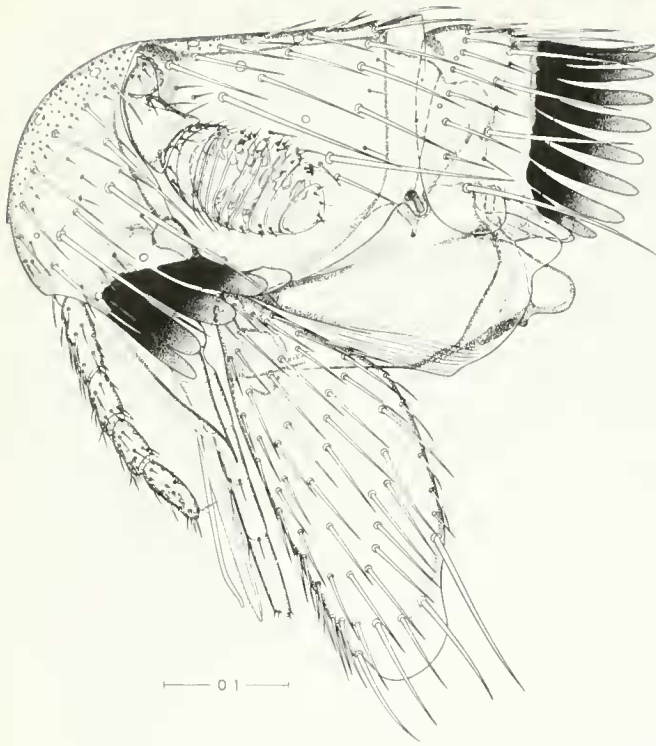
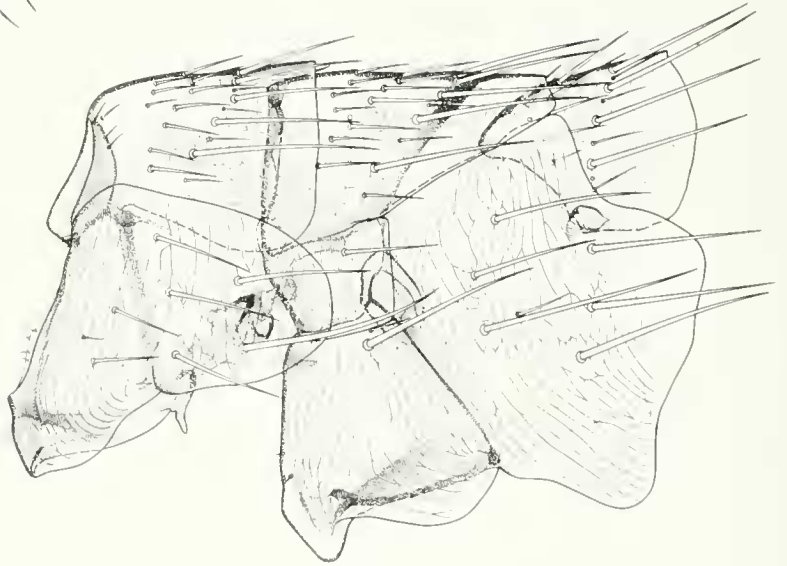


Fig. 36. *Adoratopsylla antiqorum discreta* (Jordan). Male: a, apex of aedeagus. b, aedeagus.



a



b

K. Miyasaka

Fig. 37. *Adoratopsylla antiquorum rara*, new subspecies. Male: a, head, prothorax and procoxa. b, meso- and metathorax and first abdominal segment.

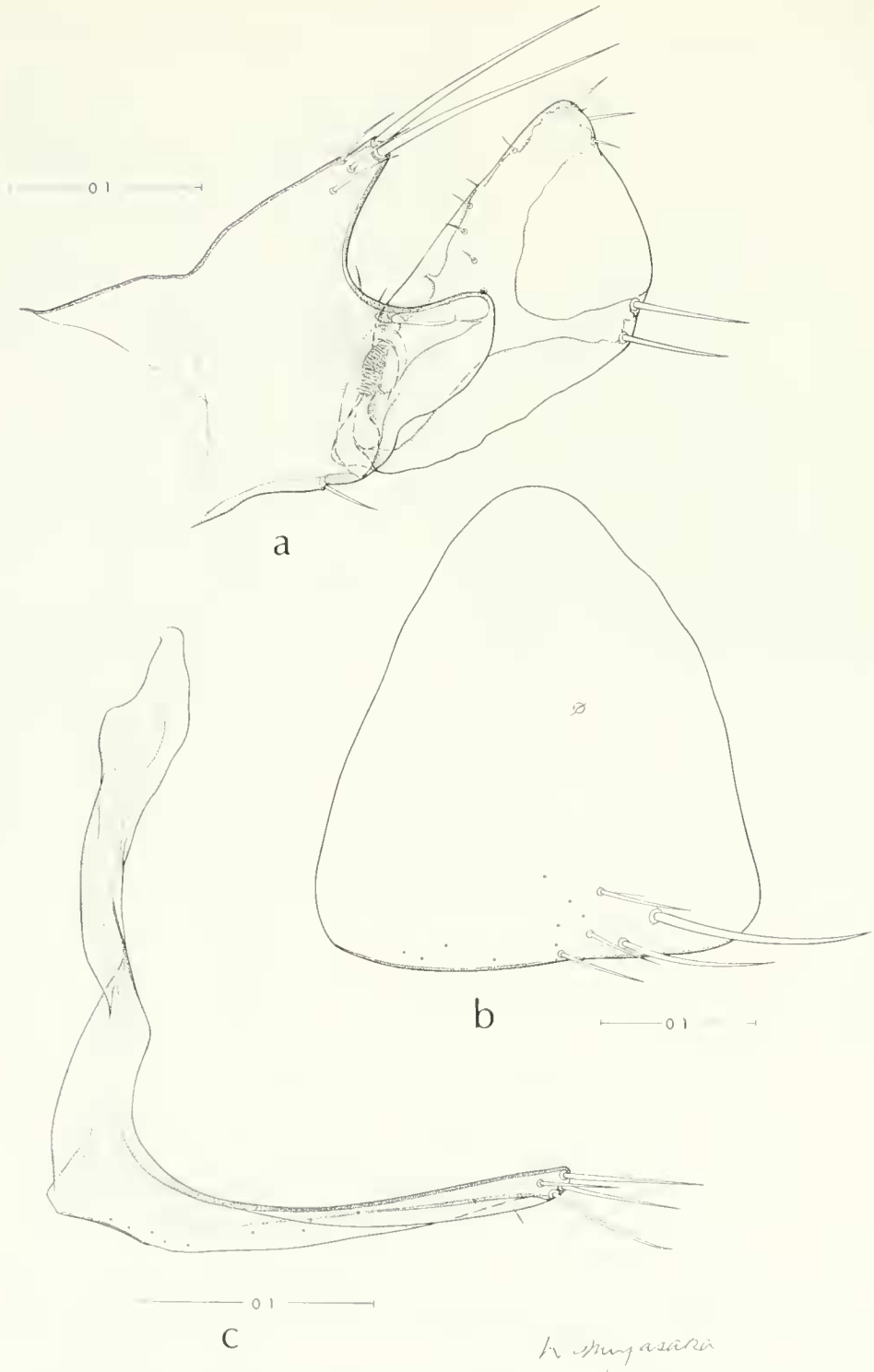


Fig. 38. *Adoratopsylla antiquorum rara*, new subspecies. Male: a, process and movable finger of clasper. b, eighth sternum. c, ninth sternum.



01

a

K. Miyasaka



01

b

Fig. 39. *Adoratopsylla antiquorum rara*, new subspecies. Male: a, apex of aedeagus. b, aedeagus.

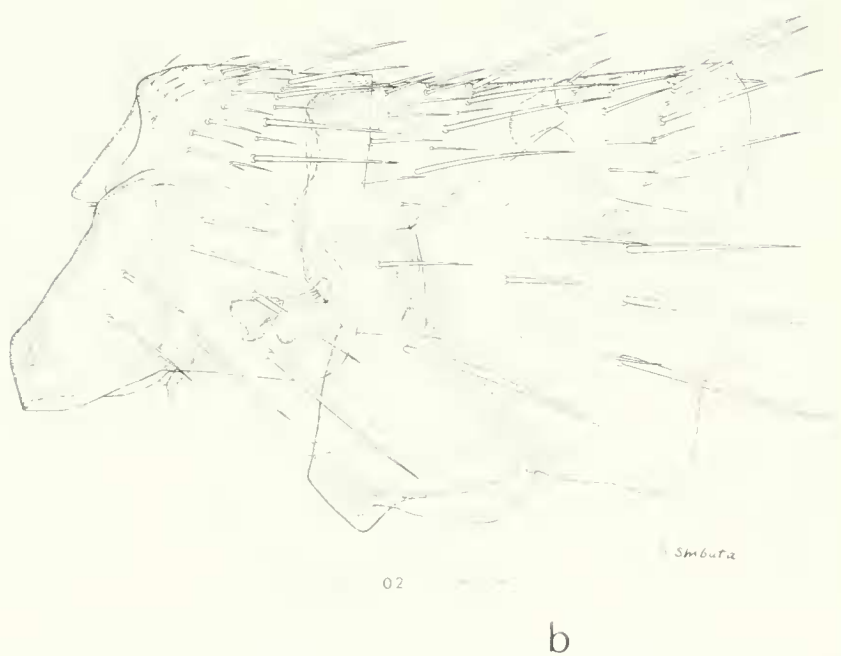


Fig. 40. *Adoratopsylla antiquorum recta*, new subspecies. Male: a, head, prothorax and procoxa. b, meso- and metathorax and first abdominal segment.

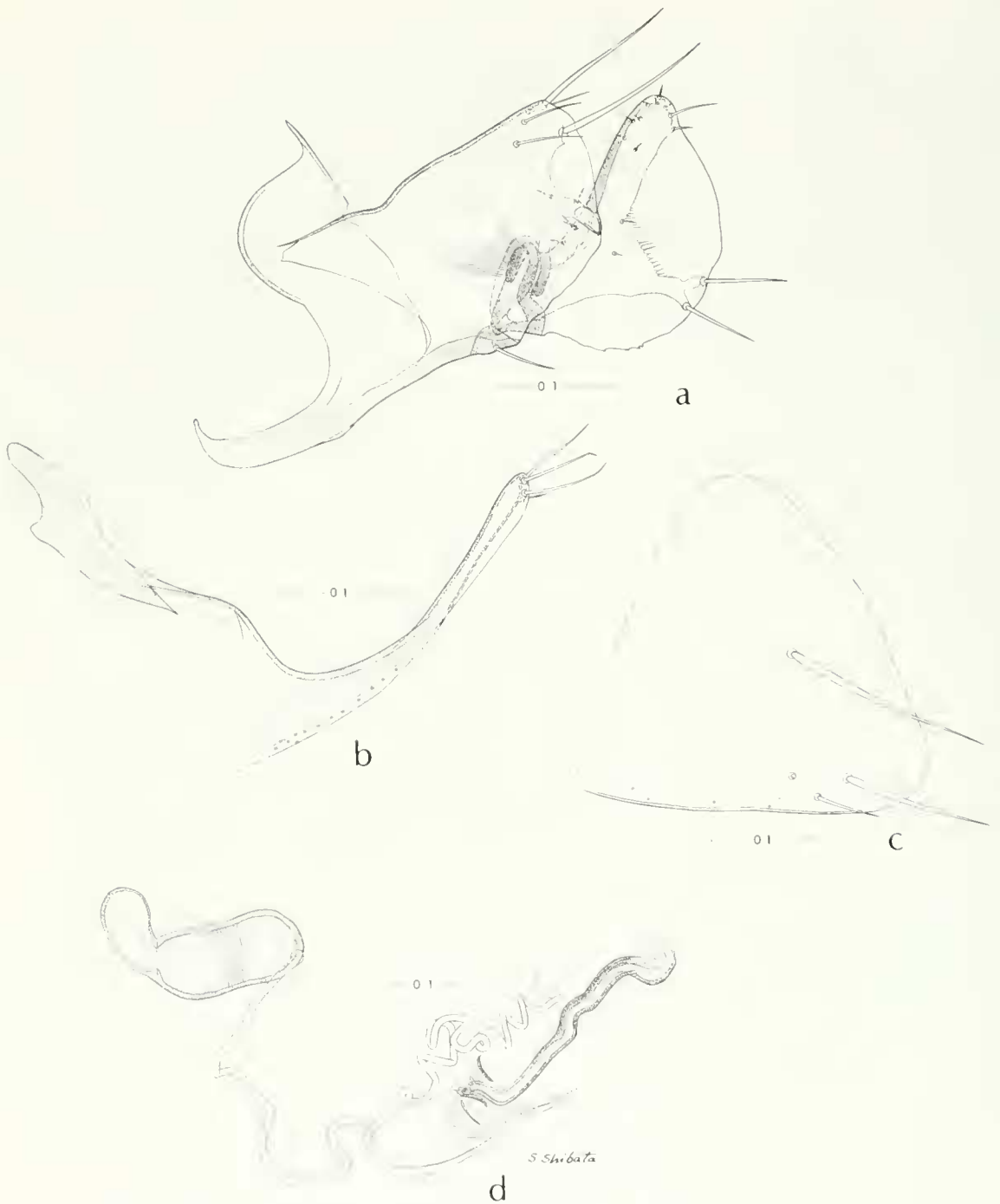


Fig. 41. *Adoratopsylla antiquorum recta*, new subspecies. Male: a, process and movable finger of clasper. b, ninth sternum. c, eighth sternum. Female: d, spermatheca, duct of spermatheca and bursa copulatrix.

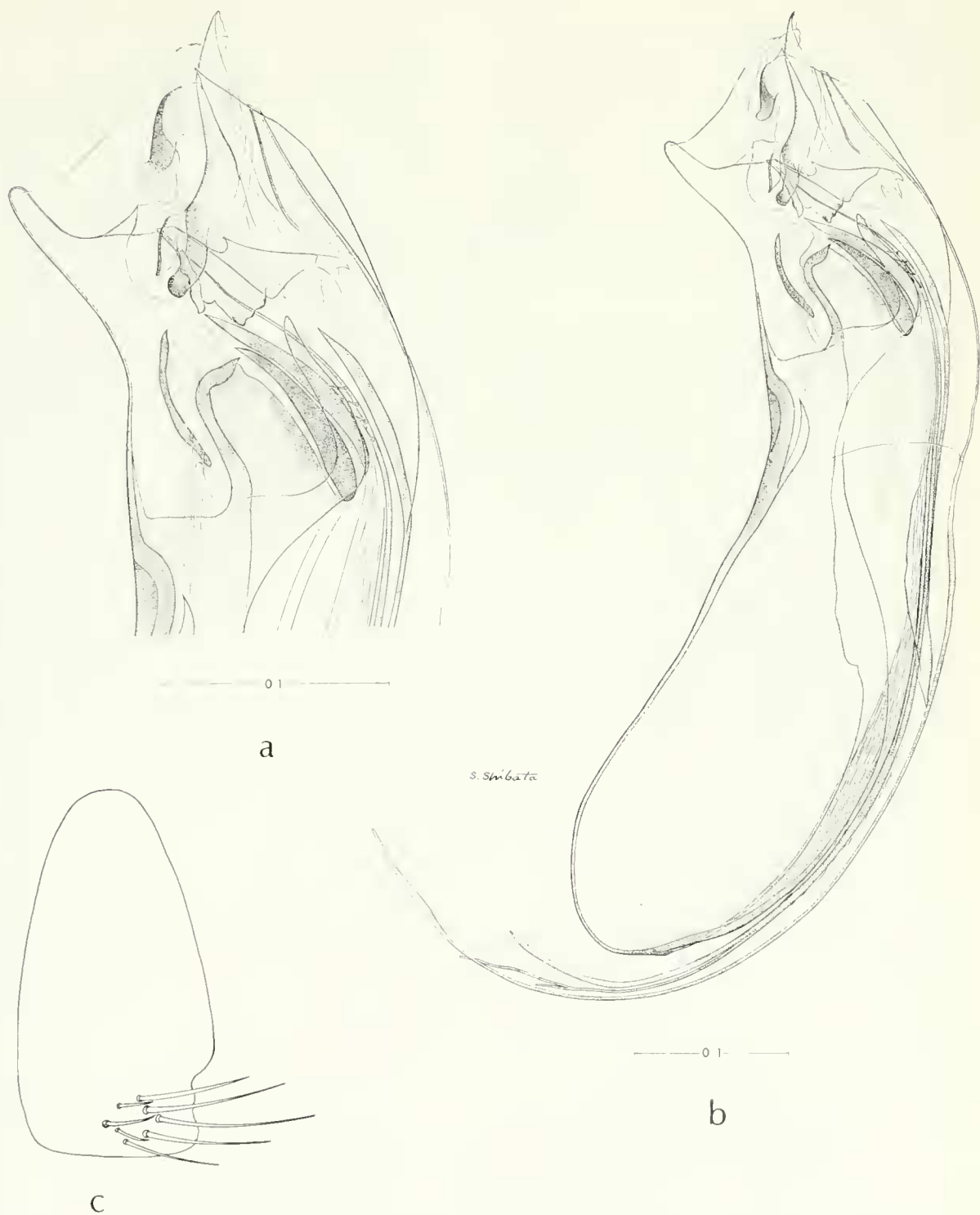


Fig. 42. *Adoratopsylla antiquorum recta*, new subspecies. Male: a, apex of aedeagus. b, aedeagus. Female: c, seventh sternum.

Aedeagus (Fig. 42): Aedeagal apodeme broad, apex rounded; penis rods longer than aedeagal apodeme but not coiled. Apex of hood of aedeagus fingerlike, end chamber a membranous flap. Crochet with broad base, upturned rounded apex.

Female (Fig. 41d). *Modified Abdominal Segments*: Seventh sternum caudal margin with broad shallow sinus, 7 stout setae near caudoventral angle. Bulga of spermatheca with almost parallel sides, striations in middle; hilla short, broad, rounded apex.

Type Data: Male holotype, female allotype, ex *Monodelphis breviceaudata* (SVP 14791), Venezuela: Falcón, near Mirimire, 250 m elev., 12-VIII-1967, Peterson team collectors; 3 male paratypes with same data; 17 male and 16 female paratypes as in Table 5.

Adoratopsylla (*Adoratopsylla*) *bisetosa* Ewing
(Fig. 43-46)

Adoratopsylla bisetosa Ewing, 1925:44.—Costa Lima and Hathaway, 1946:228.—Fox, 1947: 118.—Guimarães, 1954:509, 510, 512.—Johnson, 1957:31-32, Pl. 14, Fig. 4.—Barrera and Diaz-Ungria, 1957:165, 178.—Cova Garcia and Tallaferro, 1959:346.—Machado-Allison, 1964: 158, 159, 166, Fig. 1, 3, 5.—1966:24.

Type Data: Three males, 3 females ex *Monodelphis breviceaudata*, Brazil: Rio Branco Santa Maria, 8-IX-1924.

Other Recorded Distribution: Venezuela: ex *Monodelphis breviceaudata*.

VENEZUELAN RECORDS (7 males and 3 females)

Three males and 2 females ex *Monodelphis breviceaudata* from Sucre, 1 male ex *Monodelphis breviceaudata* from Bolivar, and 3 males and 1 female ex *Sigmomys alstoni* from Bolivar.

REMARKS

Morphological differences in specimens from Sucre and Bolívar are evident but appear to be varietal in nature. *A. bisetosa* is probably a marsupial flea but our data are inadequate for determining the optimum environment.

Adoratopsylla (*Adoratopsylla*) *dilecta* Jordan
(Fig. 47-50)

Adoratopsylla dilecta Jordan, 1938b:168, Fig. 113, 114.—Costa Lima and Hathaway, 1946: 228.—Guimarães, 1954:513.—Johnson, 1957: 32.—Barrera and Diaz-Ungria, 1957:165, 178.—Cova Garcia and Tallaferro, 1959:331, 346.—Machado-Allison, 1964: 158, 159, 166, Fig. 2, 4, 6.—1966:26

Type Data: Female holotype ex *Marmosa murina*, Venezuela: Ayantepui Plateau, 1850 m elev., G. H. H. Tate collector.

Other Recorded Distribution: Venezuela: State of Monagas, Caripe, ex *Marmosa robinsoni*.

VENEZUELAN RECORDS (30 males and 33 females)

There were 25 males and 21 females ex 7 *Marmosa fuscata* from Carabobo, Monagas, and Distrito Federal. Other hosts include: *Marmosa robinsoni* (Miranda and Monagas), *Marmosa murina* (Monagas), *Marmosa caucera* (Aragua), *Monodelphis breviceaudata* (Aragua), *Heteromys anomalus* (Monagas), *Oryzomys albigularis* (Aragua), *Oryzomys minutus* (Mérida), *Oryzomys fulvescens* (Monagas), and *Proechimys semispinosus* (Monagas).

REMARKS

Specimens illustrated (Fig. 47, 48, 49a, b, 50) are from Monagas and agree with descriptions given by Jordan (1938) and Machado-Allison (1964), except that the sinus in the

Table 5. Host and Locality for Type Specimens of *Adoratopsylla* (*Adoratopsylla*) *antiquorum recta*, New Subspecies.

Sex	Females	SVP Number	Host	Locality	Elevation in meters
2	2	2486	<i>Monodelphis breviceaudata</i>	Trujillo: Valera, nr Isnotu	900
2	4	10600	<i>Carollia perspicillata</i> ^a	Miranda, 19 km E Caracas nr Carapao	1160
4	1	14791	<i>Monodelphis breviceaudata</i>	Falcón: nr Mirimire	250
	3	14809	<i>Monodelphis breviceaudata</i>	Falcón: Mirimire, nr La Pastora	
3	3	14810	<i>Monodelphis breviceaudata</i>	Falcón: Mirimire, nr La Pastora	
4		14843	<i>Monodelphis breviceaudata</i>	Falcón: Mirimire, nr La Pastora	122
1	1	14900	<i>Monodelphis breviceaudata</i>	Falcón: Mirimire, nr La Pastora	85
1		14920	<i>Zygodontomys breviceaudata</i>	Falcón: Mirimire, nr La Pastora	90
1		14962	<i>Monodelphis breviceaudata</i>	Falcón: Mirimire, nr La Pastora	145
1	1	14970	<i>Monodelphis breviceaudata</i>	Falcón: Mirimire, nr La Pastora	160
		20113	<i>Monodelphis breviceaudata</i>	Falcón: Mirimire, nr La Pastora	125
1	-	20222	<i>Monodelphis breviceaudata</i>	Falcón: Mirimire, nr La Pastora	130
1		20284	<i>Monodelphis breviceaudata</i>	Falcón: Mirimire, nr La Pastora	155

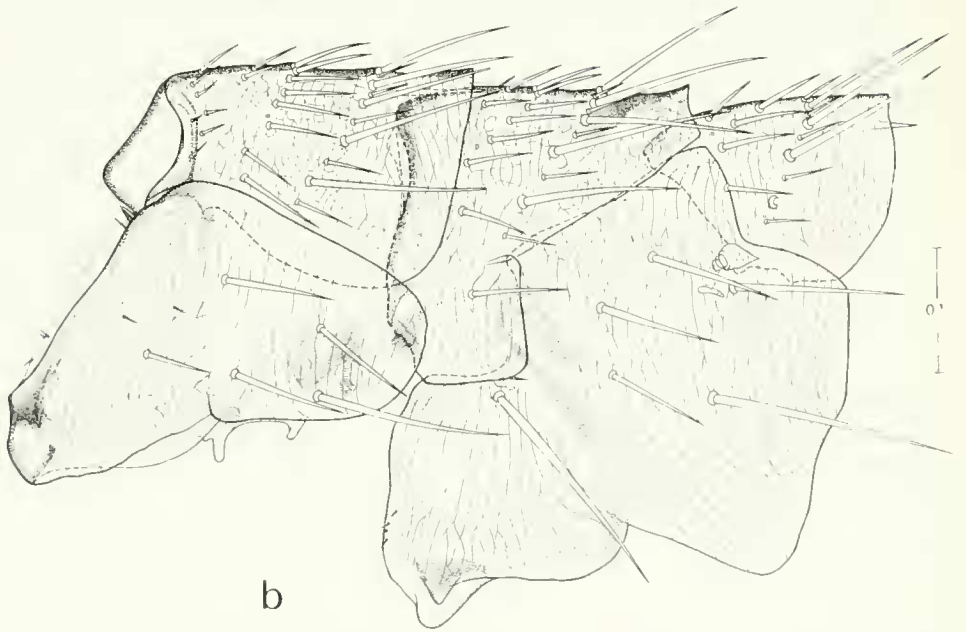


Fig. 43. *Adoratopsylla bisetosa* Ewing. Male: a, head, prothorax and procoxa. b, meso- and metathorax and first abdominal segment.

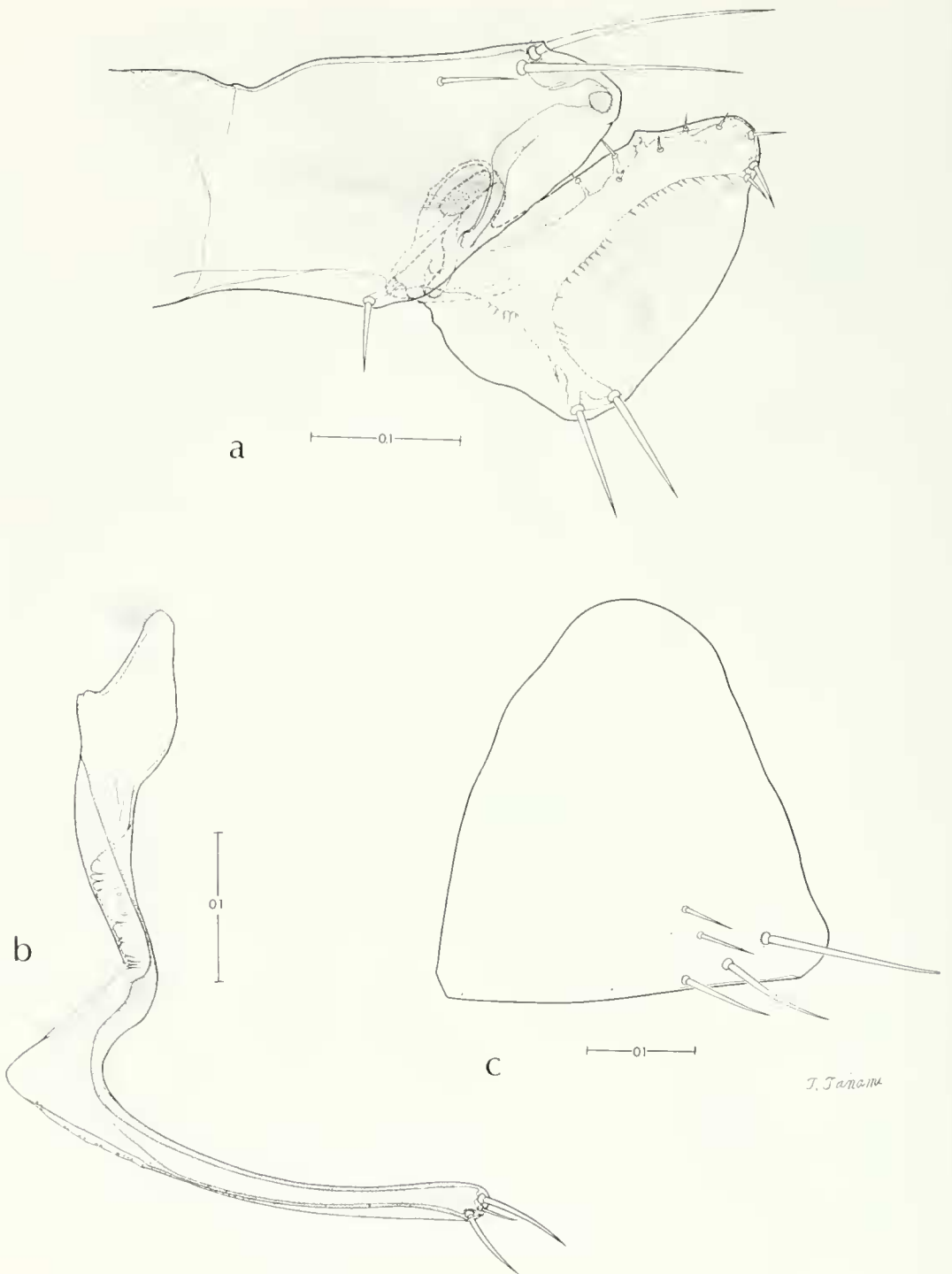


Fig. 44. *Adoratopsylla bisetosa* Ewing. Male: a, process and movable finger of clasper. b, ninth sternum. c, eighth sternum.

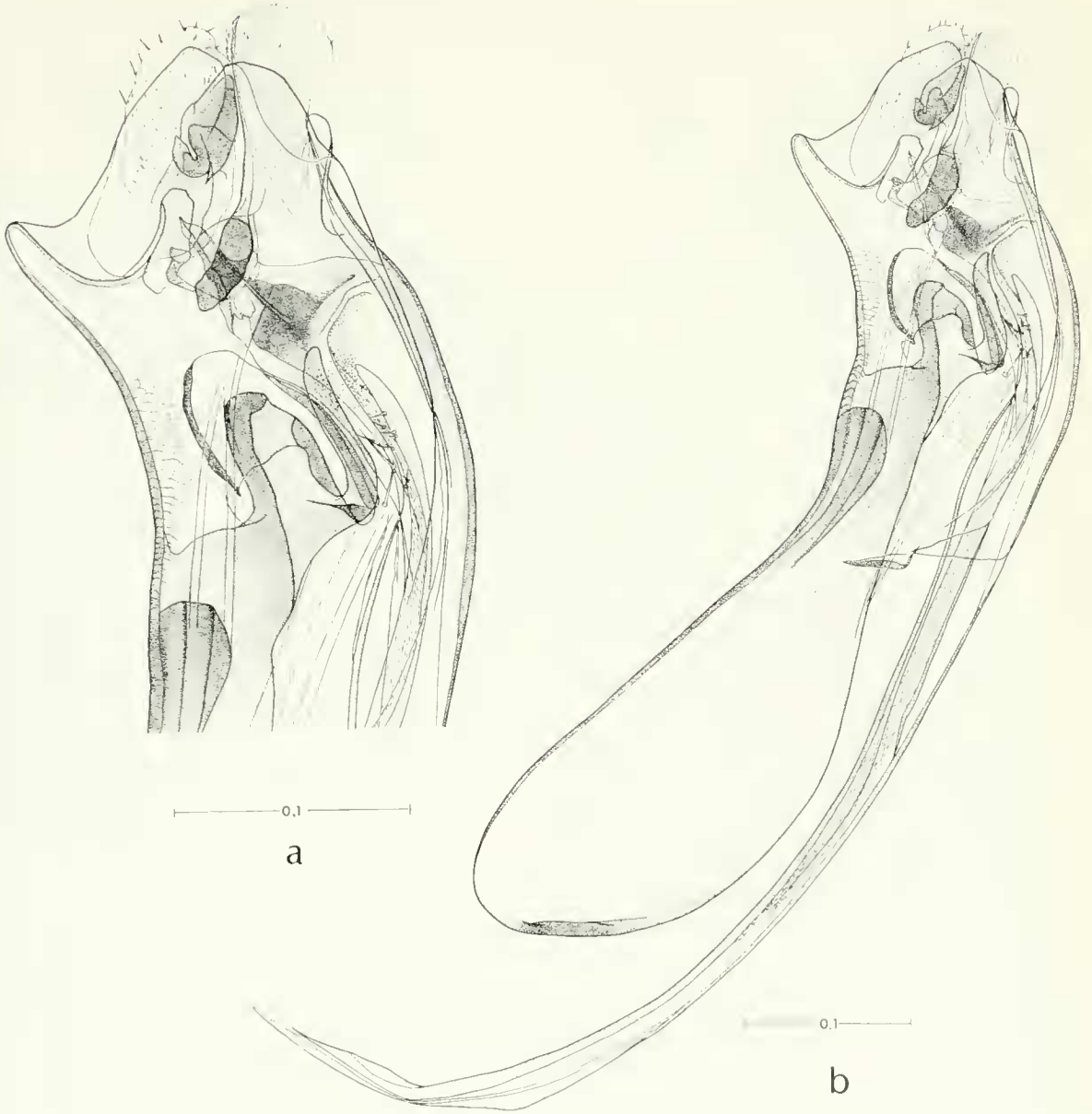


Fig. 45. *Adoratopsylla bisetosa* Ewing. Male: a, apex of aedeagus. b, aedeagus.

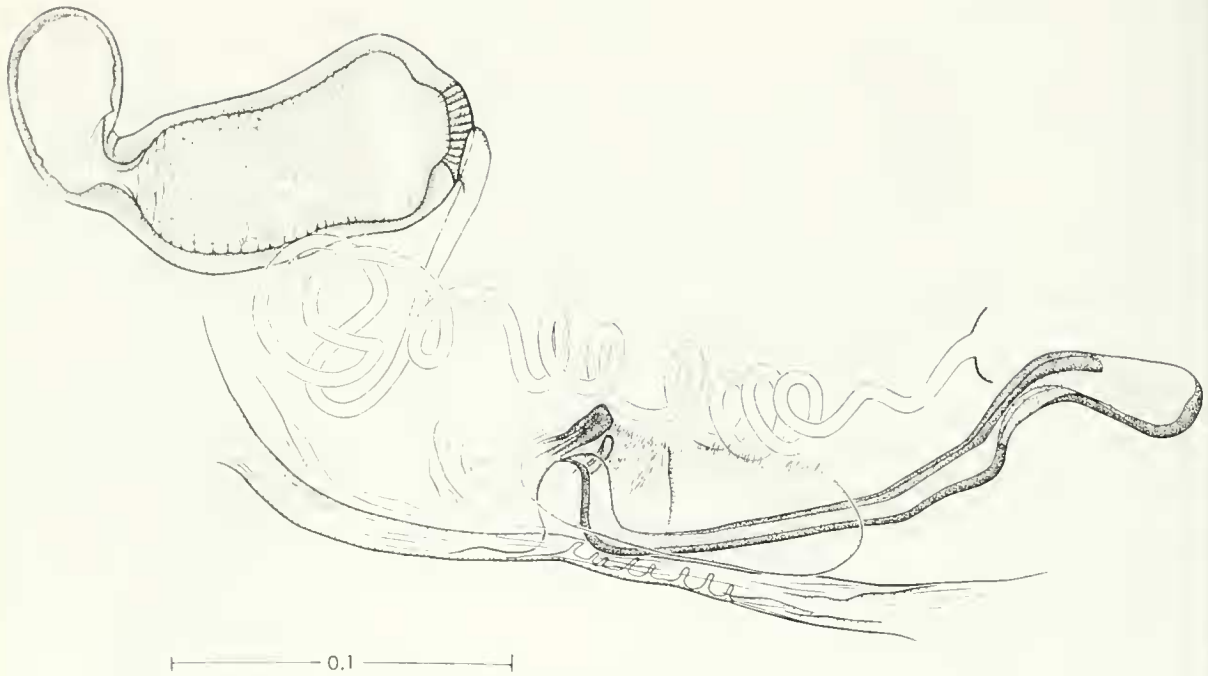


Fig. 46. *Adoratopsylla bisetosa* Ewing. Female: spermatheca, duct of spermatheca and bursa copulatrix.

posterior margin of the seventh sternum of the female is variable but usually not so triangular as shown by Machado-Allison. A short series from Aragua, Carabobo, Miranda, and Dto. Federal differs from Monagas specimens in details of the male genitalia: the posterior margin of the movable process of the clasper is not evenly rounded but has an irregular outline, the paired setae are on the ventral half of the margin and the hood of the aedeagus is not so long and narrow (Fig. 49c, d). In the female the sinus of the seventh sternum is narrower and somewhat deeper. Our records, though inadequate, indicate that *Marmosa fuscata* is the preferred host of *A. dilecta* in Venezuela although it was collected on other species of *Marmosa* as well.

Adoratopsylla (Tritopsylla) intermedia intermedia (Wagner)
(Fig. 51-54)

Typhlopsylla intermedia Wagner, 1901:22, Pl. 1, Fig. 7, 9.

Stenopsylla intermedia intermedia, Jordan, 1926: 391, Fig. 13, 14.

Tritopsylla intermedia, Pinto, 1930:349, Fig. 138, 181, 182.—Jordan, 1938b:161.—Fox, 1947:119.

Tritopsylla intermedia intermedia, Guimarães, 1910:231.—Costa Lima and Hathaway, 1946:

227, 228.—Cova Garcia and Tallaferro, 1959: 331, 347.

Adoratopsylla (Tritopsylla) intermedia intermedia, Johnson, 1957:32, 33. — Smit and Wright, 1965:22.—Hopkins and Rothschild, 1966:117-121, Fig. 175, 176, 178, 180, 183, 184, 187, 188; Pl. 3E, F.

Type Data: Type series ex unknown host, Paraguay: received from A. Poppe (Poppe was not the collector). Two females ex *Metachirus opossum* (= *Philander opossum*), Ecuador: Paracube, K. Rothschild collector. Other Recorded Distribution: Argentina, Bolivia, Brazil, Paraguay, Peru, and Venezuela: ex marsupials for the most part.

VENEZUELAN RECORDS (257 males and 335 females)

There were 171 males and 261 females ex 23 *Didelphis marsupialis* in Aragua, Barinas, Bolivar, Dto. Federal, Miranda, Monagas, and Yaracuy; 49 males and 31 females ex 7 *Didelphis azarae* in Bolivar and T. F. Amazonas. The remaining 70 specimens were collected from: *Rhipidomys venustus*, *Felis tigrina*, *Akodon urichi*, *Oryzomys minutus* (Dto. Federal); *Caluromys philander* (Dto. Federal and Monagas); *Caluromys* sp.⁴ (Monagas); *Artibeus jamaicensis*⁵, *Marmosa murina* and *Oryzomys fulvescens* (Monagas); *Philander opossum* (T. F. Amazonas); *Metachirus nudicaudata* (Barinas and Bolivar), and *Monodelphis brevicaudata* (Barinas).

REMARKS

The morphological characters which have been used to separate subspecies of *Adoratop-*

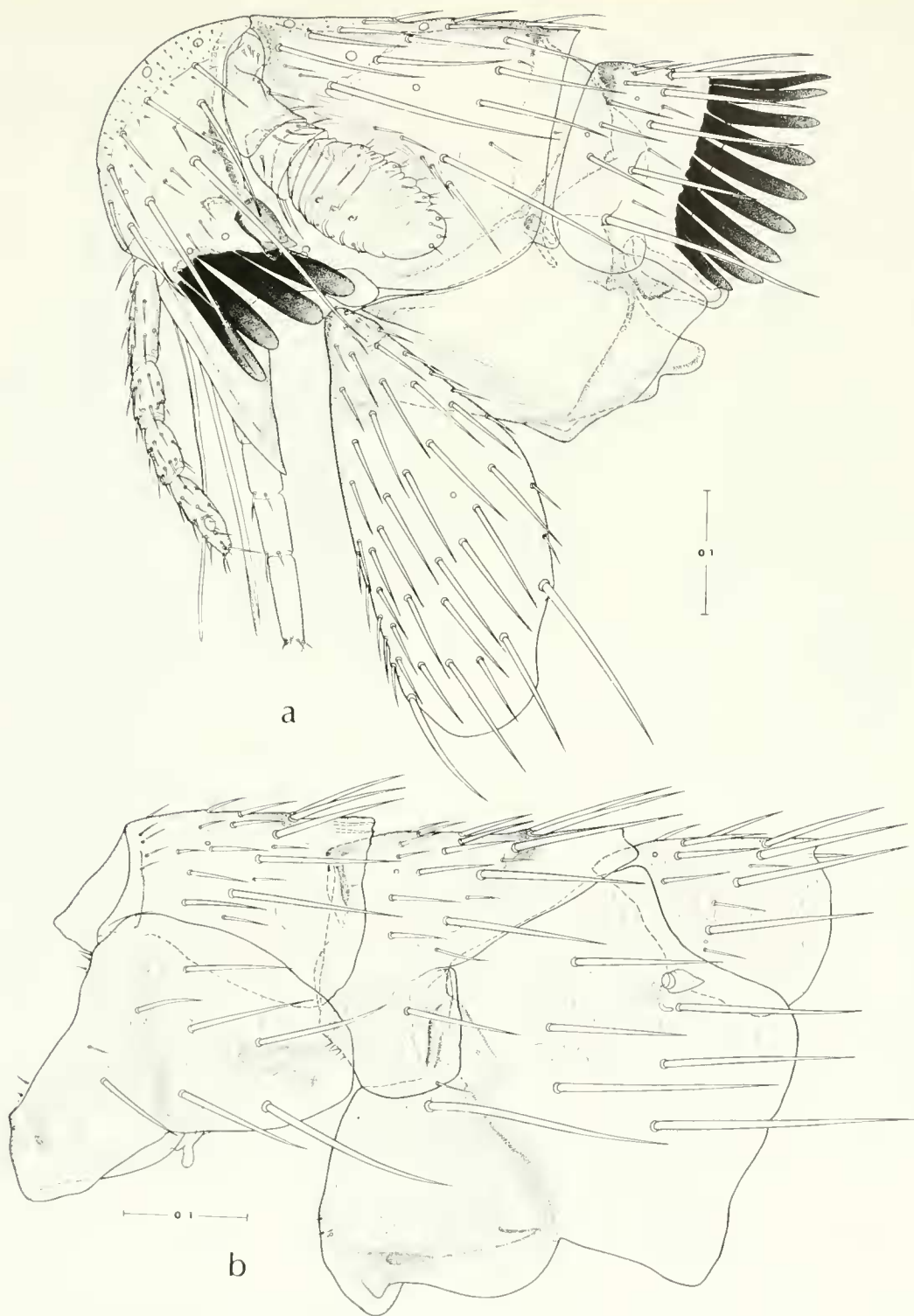


Fig. 47. *Adoratopsylla dilecta* Jordan. Male: a head prothorax and procoxa. b, meso- and metathorax and first abdominal segment.

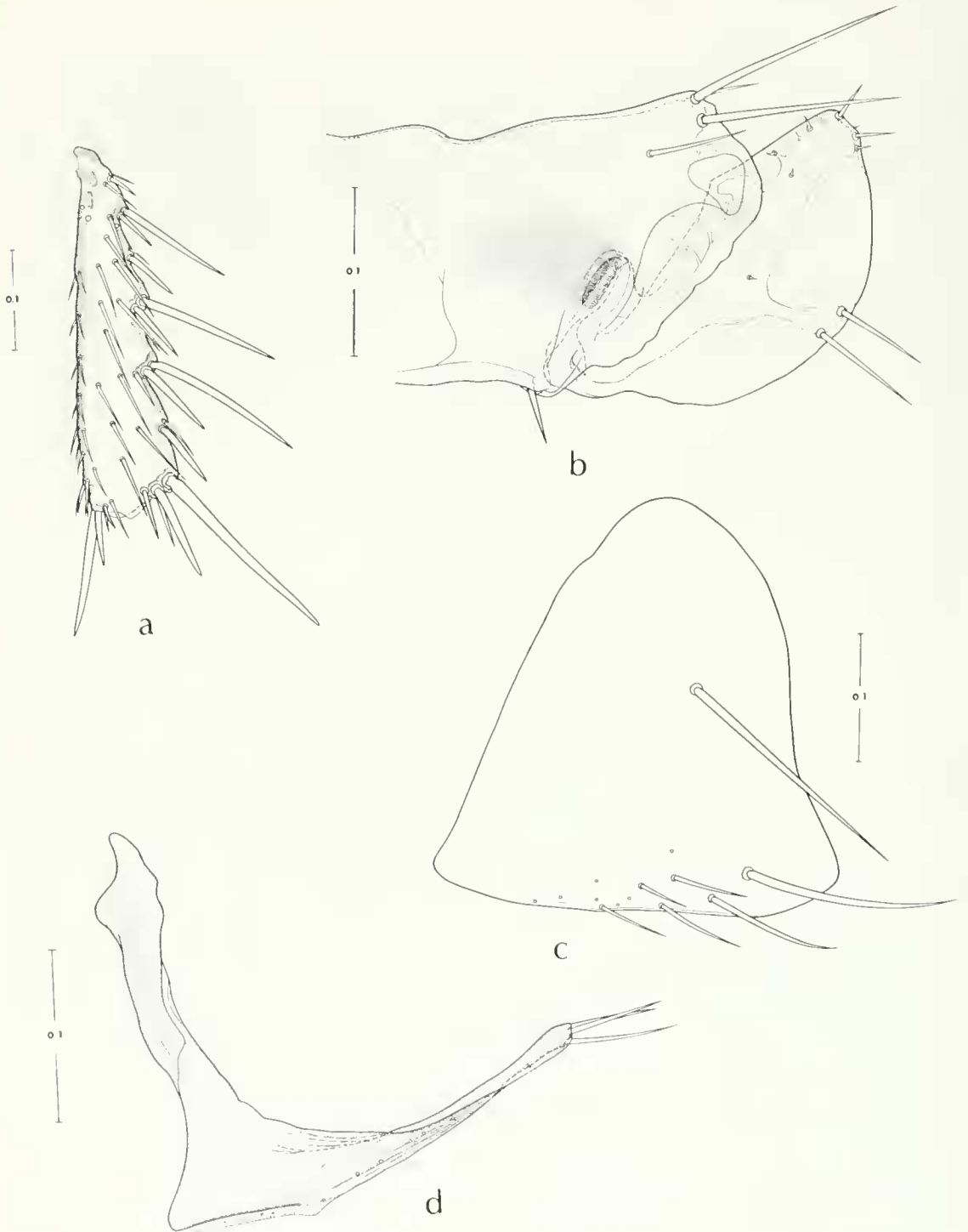


Fig. 48. *Adoratopsylla dilecta* Jordan. Male: a, metatibia. b, process and movable finger of clasper. c, eighth sternum. d, ninth sternum.

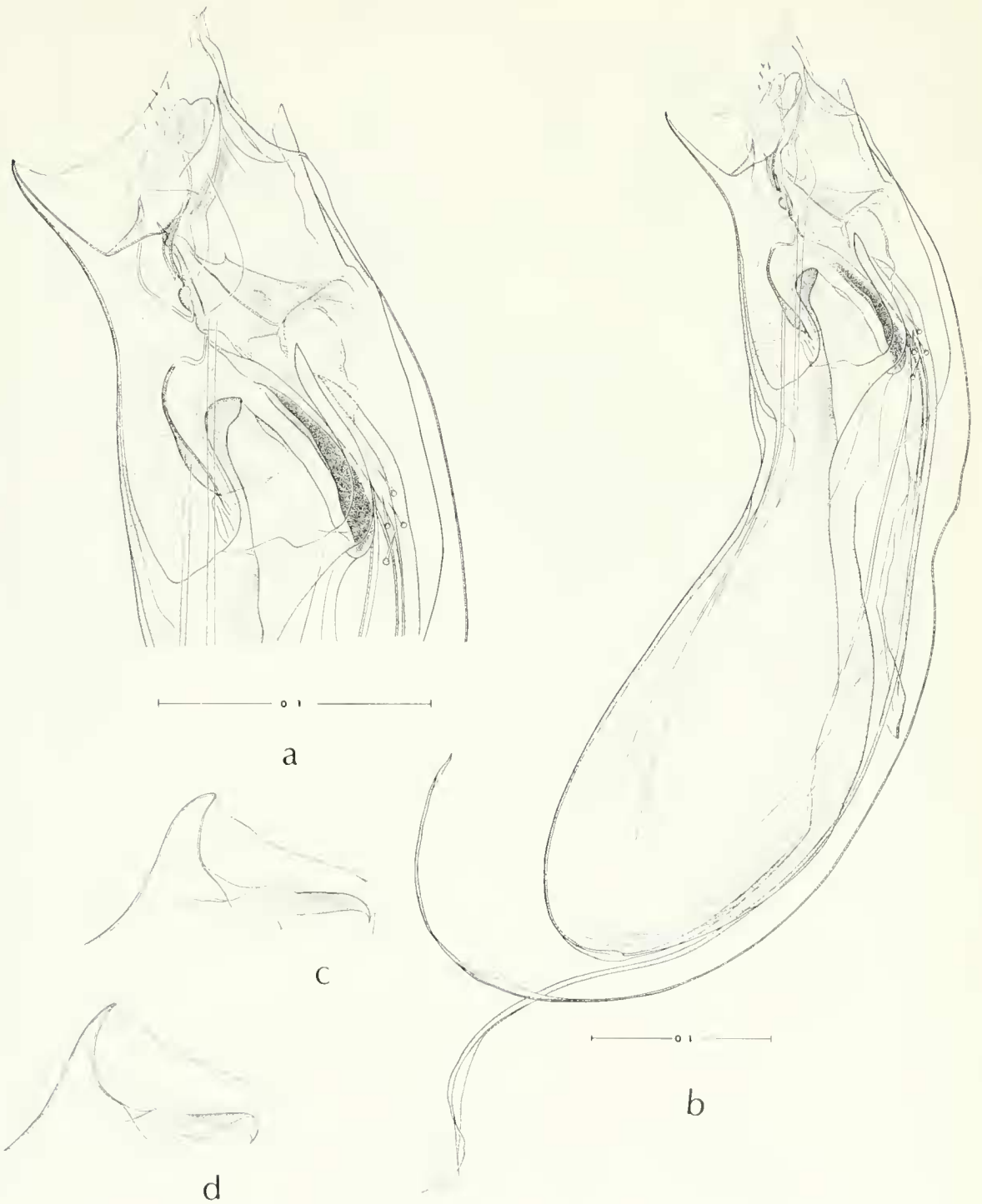


Fig. 49. *Adoratopsylla dilecta* Jordan. Male: a, apex of aedeagus. b, aedeagus. c and d, median dorsal lobe of aedeagus.

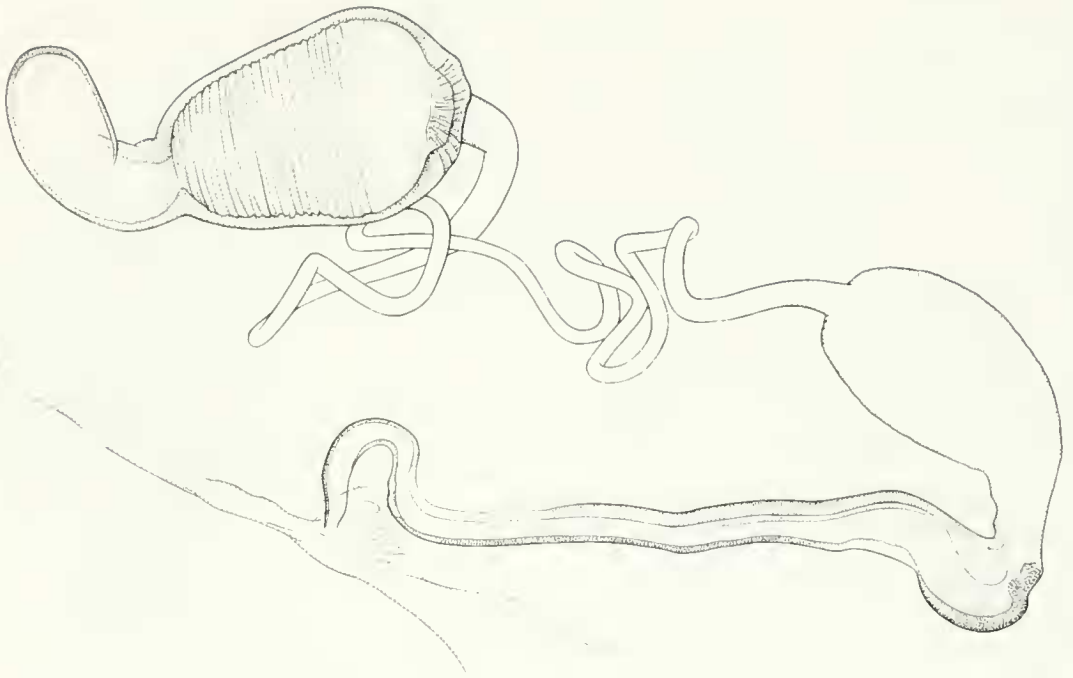


Fig. 50. *Adoratopsylla dilecta* Jordan. Female: spermatheca, duct of spermatheca and bursa copulatrix.

sylla intermedia are highly variable. Most of our specimens were collected in widely separated localities (Caracas, Monagas, Barinas, T. F. Amazonas, and Bolívar) and from a variety of hosts. In general, lobe 2 of the immovable process of the clasper is longer and narrower and the movable process is wider in specimens from Caracas versus those from Bolívar but in a long series of 47 males and 87 females from a single host the variation is almost as great as in the material from all of Venezuela. We concur with Hopkins and Rothschild (1966) and Guimarães (*in litt.*) in calling Venezuelan specimens *Adoratopsylla intermedia intermedia*.

We collected 432 specimens of *A. i. intermedia* from 25 specimens of *Didelphis marsupialis* and 80 from 7 *Didelphis azarae*. Thus of the 582 specimens of *A. i. intermedia* collected 88% were associated with marsupials of the genus *Didelphis* and the remaining 12% from other hosts.

Genus *Neotyphloceras* Rothschild

Neotyphloceras Rothschild, 1914:243.

Type Species: *Typhloceras rosenbergi* Rothschild.

Neotyphloceras rosenbergi (Rothschild)
(Fig. 55-58)

Typhloceras rosenbergi Rothschild, 1904:639, Pl. 13, Fig. 68-69, 71, 74; Pl. 14, Fig. 71, 74.

Palcopsylla rosenbergi, Baker, 1905:153.

Neotyphloceras rosenbergi, Rothschild, 1914: 244.—Jordan, 1936:310.—Costa Lima and Hathaway, 1946:229.—Macchiavello, 1948: 26.—Jordan, 1950:605.—Johnson, 1957:27, Pl. 9, Fig. 3, 4; Pl. 10, Fig. 4.—Machado-Allison, 1964:164, 165.—1966:26.—Hopkins and Rothschild, 1966:131-133, Fig. 115, 198, 199, Pl. 4C, 4D.

Type Data: One male, 2 females ex *Metachirus opossum* (= *Philander opossum*), Ecuador: Cayembe, 12-VI-1897, W. F. H. Rosenberg collector. One male, 6 females *ibid.* but ex *Didelphis azarae*, 21-VI-1897. Two females *ibid.* but Ibarra, 31-V-1897.

Other Recorded Distribution: Ecuador, thirteen localities, ex species of the following genera: *Didelphis*, *Oryzomys*, *Rhipidomys*, *Thomasomys*, *Akodon*, *Sigmodon*, *Stictomys*, and rats and their nests. Peru: three localities, ex species of the following genera: *Oryzomys*, *Rhipidomys*, and *Akodon*. Colombia: four localities, ex species of the following genera: *Marmosa*, *Sciurus*, *Oryzomys*, *Rhipidomys*, *Thomasomys*, *Chilomys*, *Rheomys*, *Stictomys*, and *Mustela*, (for more detailed information see Johnson, 1957).



Fig. 51. *Adoratopsylla intermedia intermedia* (Wagner). Male: a, head, prothorax and procoxa. b, meso- and metathorax and first abdominal segment.

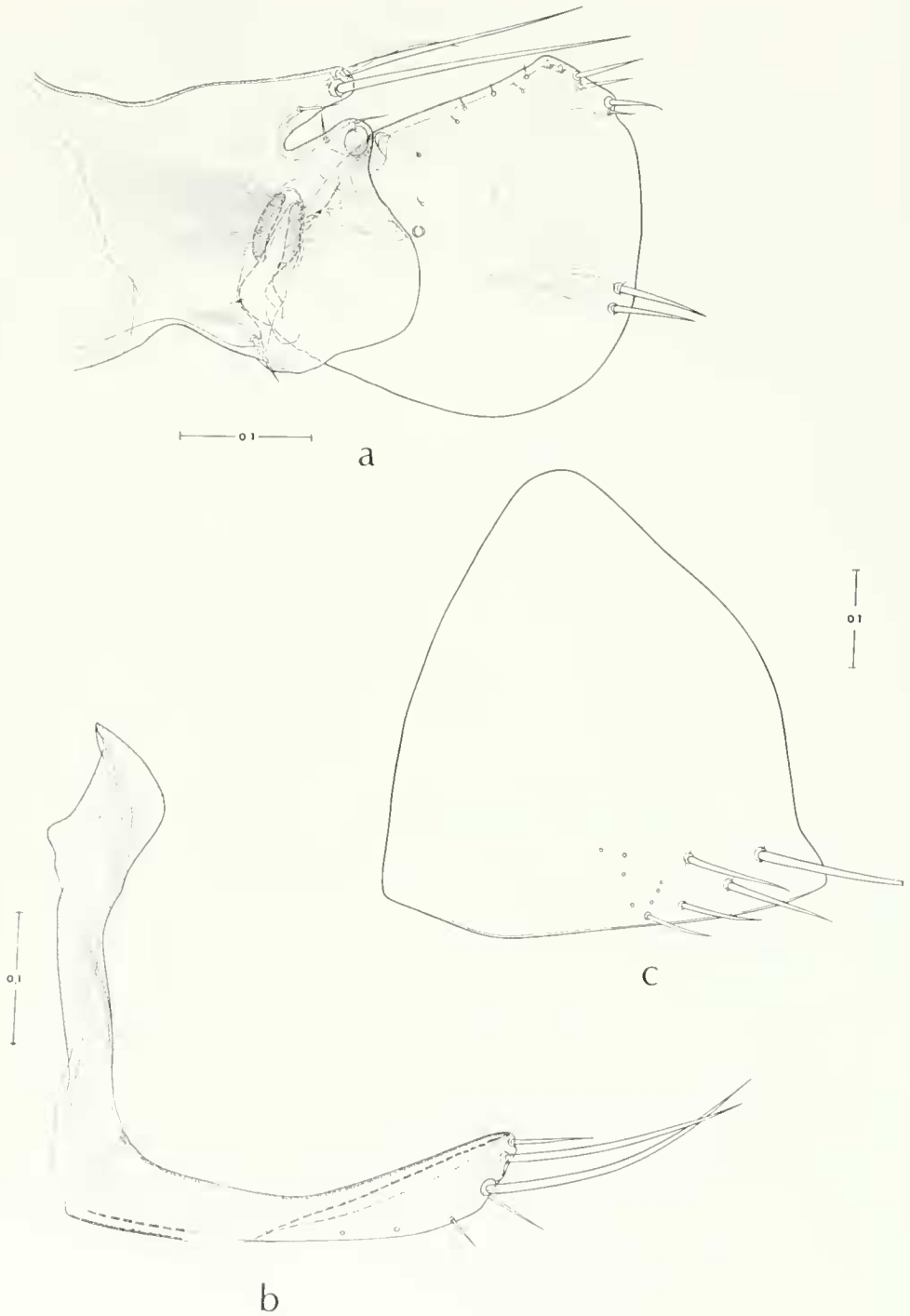


Fig. 52. *Adoratopsylla intermedia intermedia* (Wagner). Male: a, process and movable finger of clasper. b, ninth sternum. c, eighth sternum.

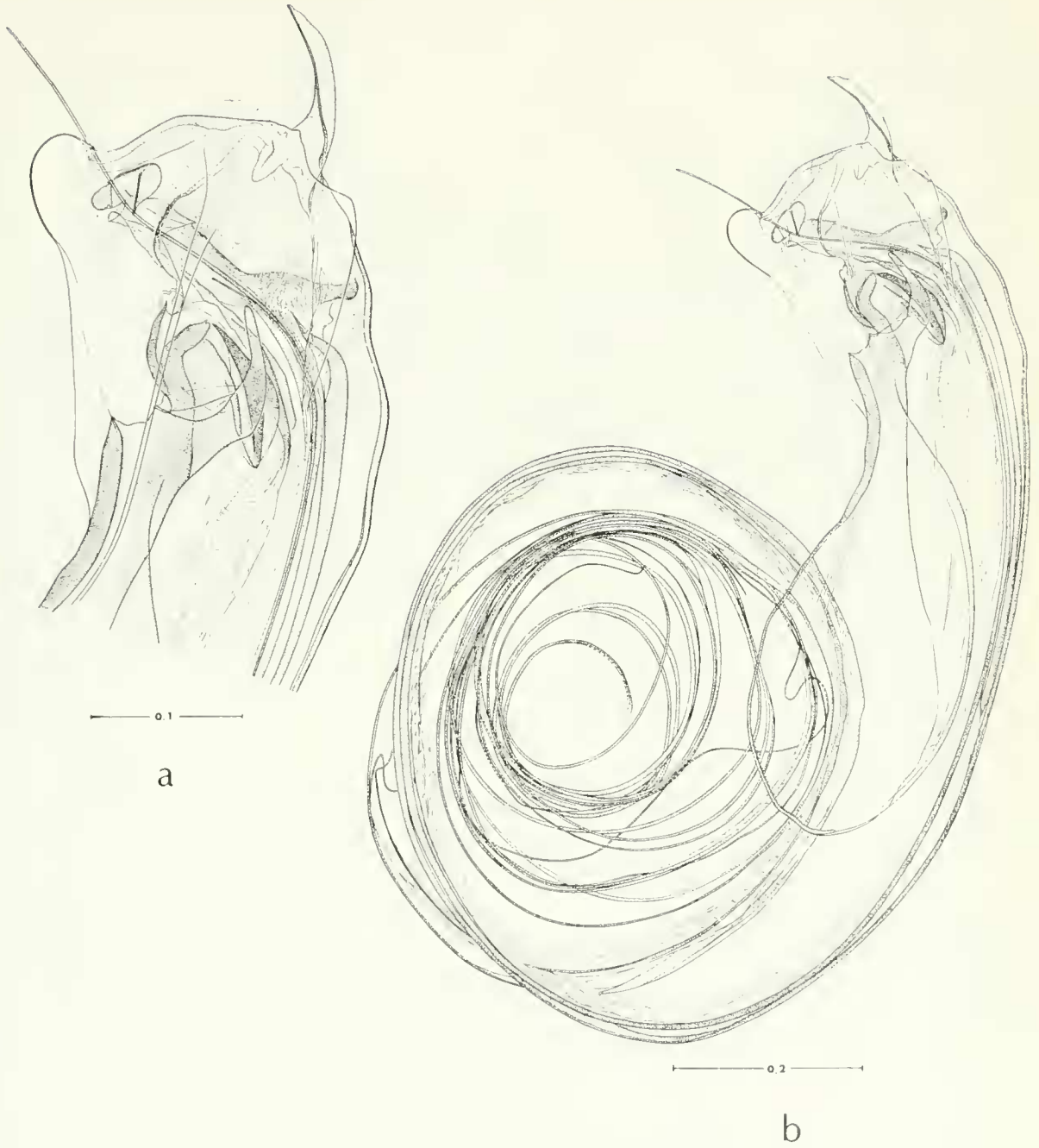


Fig. 53. *Adoratopsylla intermedia intermedia* (Wagner). Male: a, apex of aedeagus. b, aedeagus.

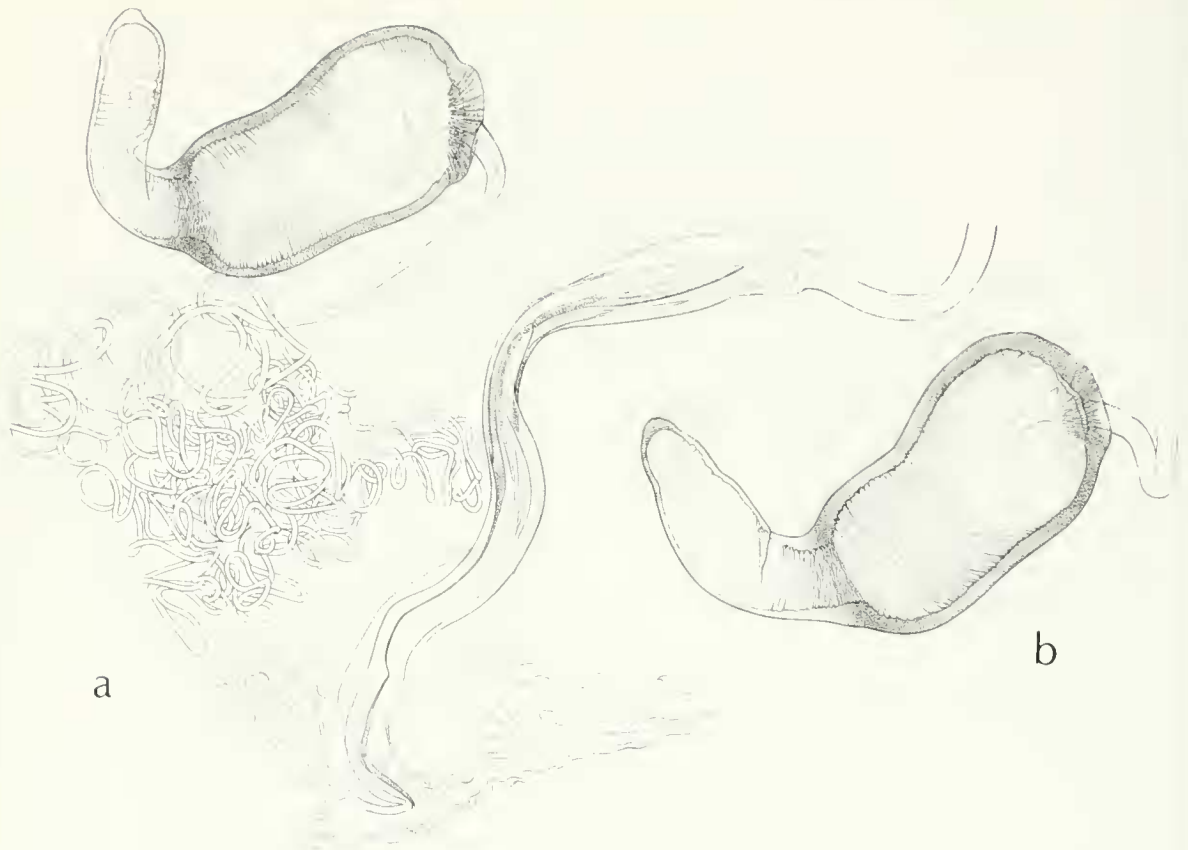


Fig. 54 *Adonatosylla intermedia intermedia* (Wagner). Female. a, spermatheca, duct of spermatheca and bursa copulatrix. b spermatheca.

VENEZUELAN RECORDS (87 males and 112 females). See Table 6.

REMARKS

Initially it appeared that there were at least two and perhaps three distinct geographic populations represented in our collections based on the shape and length of the fingerlike apodeme

at the base of the claspers, width of and degree to which the manubrium is curved and length of the finger of the clasper. However, in one series of 17 males and 28 females from a single host (*Didelphis azarae*) there is considerable variation in these characters though not as much as between populations. Venezuelan specimens do not agree in all details with illustrations given

Table 6. Venezuelan Records of *Neotyphloceras rosenbergi* (Rothschild).

Host Animals	Collecting Localities									
	Caracas 1474-2259 m elevation		Tunillo 2210-2360 m elevation		Merida 2560-3155 m elevation		Monaga 1200-1340 m elevation		Fachura 2370-2425 m elevation	
	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀
<i>Rhipidomys cinctus</i>	(5)	4 2	(9)	9 13	(3)	1 2	(3)	4 2	(6)	3 3
<i>Oryzomys albicularis</i>	(13)	8 5	(4)	0 5	(1)	0 1			(1)	1 0
<i>Oryzomys concolor</i>	(1)	1 0					(1)	0 1		
<i>Oryzomys minutus</i>	(1)	0 1	(1)	0 1	(6)	1 6			(1)	1 0
<i>Thomasomys laniger</i>			(7)	6 5	(2)	1 3				
<i>Thomasomys lugens</i>			(1)	0 1	(7)	18 13				
<i>Thomasomys hypophilus</i>									(8)	3 6
<i>Thomasomys vestitus</i>			(1)	1 0						
<i>Heteromys anomalus</i>	(2)	2 1								
<i>Didelphis azarae</i>					(2)	17 29				
<i>Caluromys philander</i>							(1)	6 3		
<i>Marmosa dryas</i>			(3)	0 4	(1)	0 1				

The numbers of host animals are represented by the numerals in parentheses.



Fig. 55. *Neotyphloceras rosenbergi* (Rothschild). Male: a. head, prothorax and procoxa. b. meso- and meta-thorax and first abdominal segment.



Fig. 56. *Neotyphloceras rosenbergi* (Rothschild). Male: a, process and movable finger of clasper. b, ninth sternum. c, eighth sternum.

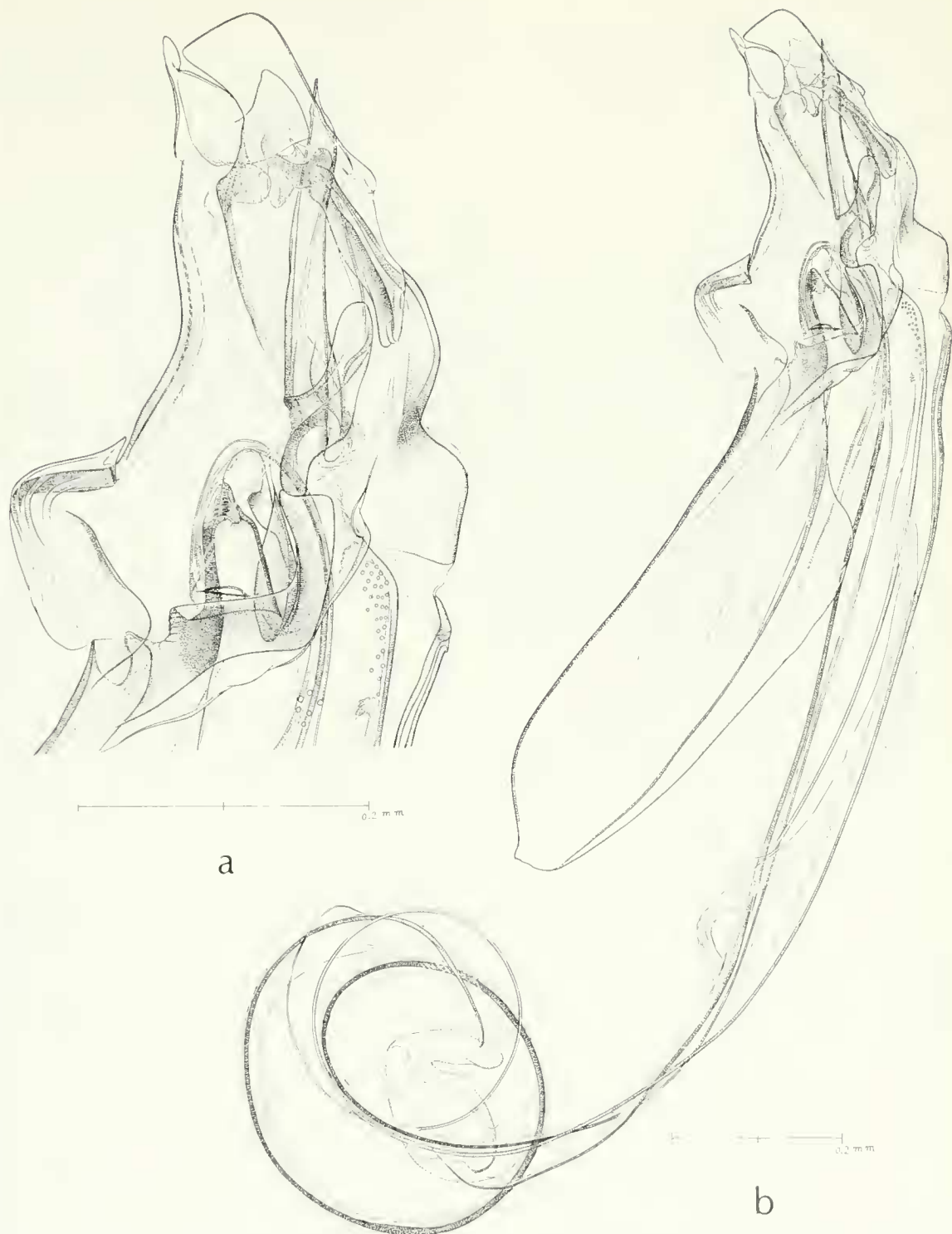


Fig. 57. *Neotyphloceras rosenbergi* (Rothschild). Male: a. apex of aedeagus. b, aedeagus.

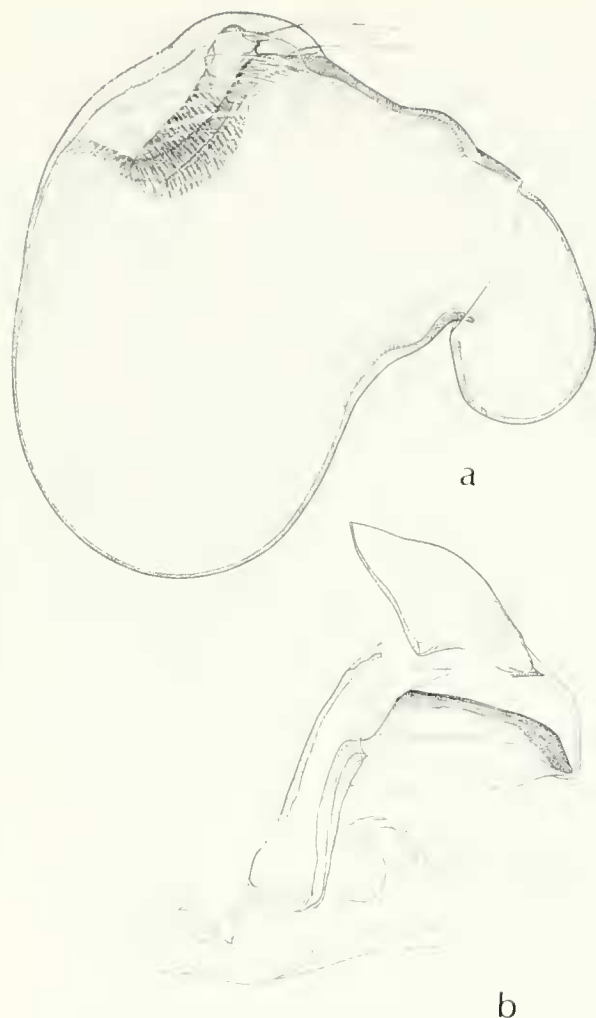


Fig. 58. *Neotyphloceras rosenbergi* (Rothschild). Female: a, spermatheca. b, bursa copulatrix.

by Johnson (1957). This is particularly true of the apical portion of the distal arm of the ninth sternum and the aedeagus. The male genitalia in this species is exceptionally complex and several structures are very delicate and thus susceptible to distortion. Some of the variation may be due to this factor but in addition this species is probably represented by several large relatively isolated populations each of which occurs on a host species.

According to Smit (1967) the genal spines of our specimens are more truncate than in specimens from other areas.

Although *N. rosenbergi* appears to be promiscuous in its host associations it is likely a marsupial flea. From one host (*Didelphis azarae*), captured above 2,743 meters elevation, we collected 17 male and 28 female fleas. There were 57 fleas on 26 host animals (four species of *Thomomys*) 43 fleas on 26 host animals

(*Rhipidomys venustus*), and 21 fleas on 20 host animals (*Oryzomys albigularis*). Essentially all specimens of *N. rosenbergi* were collected above 1,829 meters elevation.

Family Stephanocircidae

Genus *Cleopsylla* Rothschild

Cleopsylla Rothschild, 1914:246.

Type Species: *Cleopsylla townsendi* Rothschild.

Cleopsylla monticola Smit

(Fig. 59, 60, 65a)

Cleopsylla monticola Smit, 1953:193-197 Fig. 13, 15, 17, 19, 21.—Hopkins and Rothschild 1956:127-130, Fig. 210, 214, 216, 218, 221; Pl. I 13G, 16A.—Johnson, 1957:61

Type Data: Male holotype, female allotype, ex *Caenolestes fuliginosus* (= *C. fuliginosus*), Ecuador: Pichincha, I-X-1931; 1 female and 1 male paratypes ex *Sigmodon* species, Chimborazo, IV-1931; 1 male paratype, ex *Thomomys* species, Illiniza, IV-1931, ♀ Spillmann collector.

Other Recorded Distribution: Colombia: 1 female ex *Rhipidomys* species

VENEZUELAN RECORDS (55 males and 87 females)

There were 26 males and 56 females ex 20 *Oryzomys albigularis* in Dto. Federal Trujillo, Mérida, and Táchira. Also, 8 males and 7 females ex 9 *Oryzomys minutus* in Trujillo, Mérida and Táchira. There were 5 males and 9 females ex 9 *Rhipidomys venustus* and 1 *Rhipidomys* sp.¹ in Trujillo, Mérida, and Táchira; 12 males and 11 females ex *Thomomys laniger* (Trujillo and Mérida), *Thomomys hylophilus* (Táchira), *Thomomys lugens* (Trujillo and Mérida), *Thomomys vestitus* (Trujillo), and *Thomomys* sp.¹ (Mérida). In addition 8 specimens were collected from *Marmosa fuscata* (Dto. Federal), *Marmosa diyas* (Trujillo), *Didelphis marsupialis* (Trujillo), *Chilomys intrans* (Táchira), and birds³ (Dto. Federal and Mérida).

REMARKS

There is some intraspecific variation. In our specimens the anterior margin of the frons is convex as in *C. townsendi*. The spine on the genal process and the occipital tubercle are better developed than shown by Smit (1953) for *C. townsendi* and *C. monticola*. Our collection records, though rather meager, suggest that this flea is more ecologically tolerant than other species in the family. The areas in which it was collected varied in elevation from 1413 meters to 3170 meters but most specimens were collected at 2200-2500 meters and one specimen was collected on *Didelphis marsupialis* at 120 meters elevation. *Oryzomys albigularis* is probably the

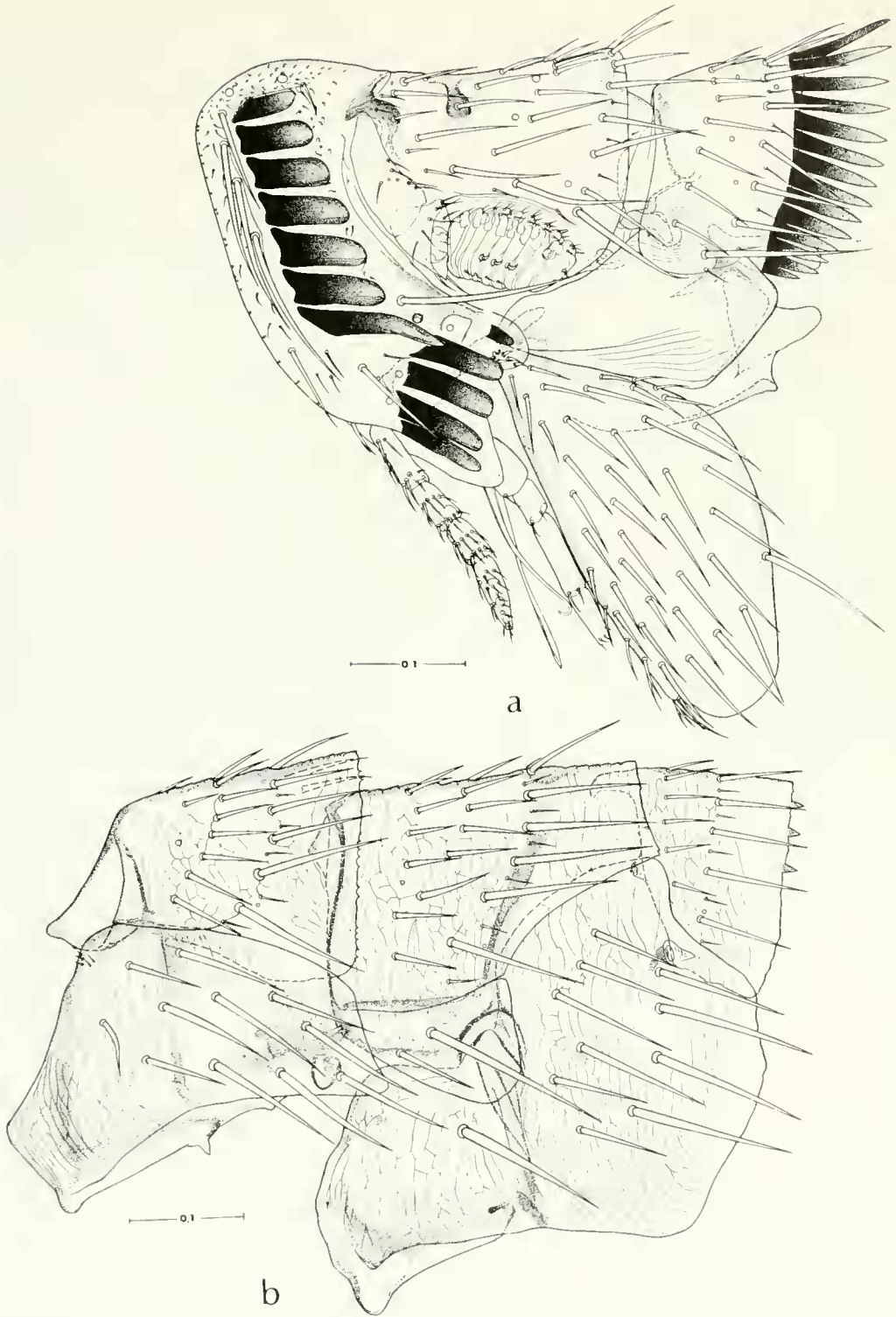


Fig. 59. *Cleopsylla monticola* Smit. Male: a, head, prothorax and procoxa. b, meso- and metathorax and first abdominal segment.

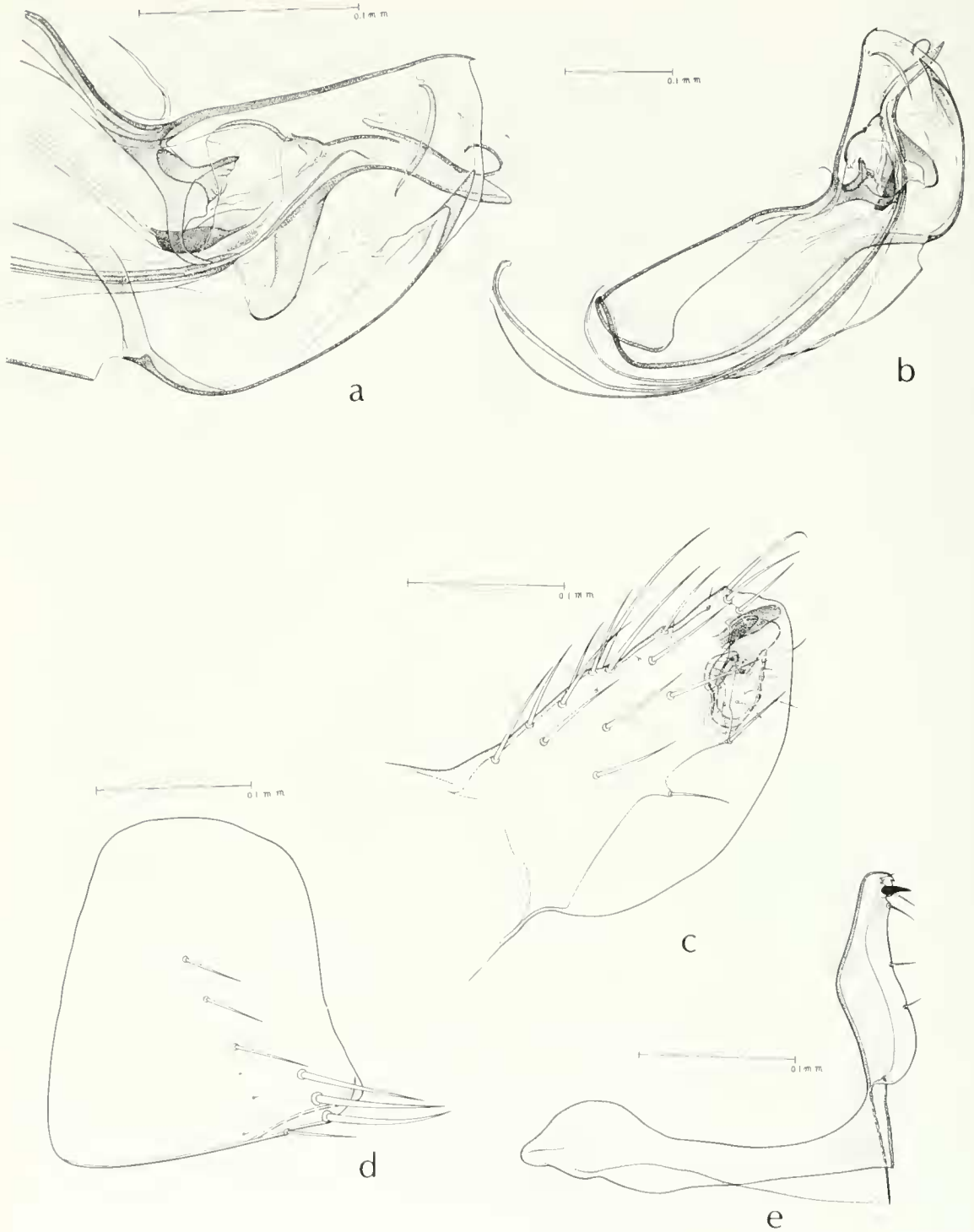


Fig. 60. *Cleoposylla monticola* Smit. Male: a, apex of aedeagus. b, aedeagus. c, process and movable finger of clasper. d, eighth sternum. e, ninth sternum.

preferred host in Venezuela although it occurred on species of *Thomasonys* and *Rhipidomys* with sufficient frequency to indicate more than an accidental relationship.

Genus *Craneopsylla* Rothschild

Craneopsylla Rothschild, 1911:120.

Type Species: *Stephanocircus wolffhuegeli* Rothschild.

Craneopsylla minerva minerva (Rothschild)
(Fig. 61-64, 68b)

Stephanocircus minerva Rothschild, 1903b:319,
Pl. 9, Fig. 6, 7.

Craneopsylla minerva, Rothschild, 1914:251.

Craneopsylla minerva minerva, Hopkins, 1951:
537, Fig. 5.—Smit, 1953:201, Fig. 32.—Hop-
kins and Rothschild, 1956:140-142, Fig. 237,
238; Pl. 14B, 17B.—Johnson, 1957:65, 66.

Type Data: Female holotype and paratype fe-
male ex *Didelphis azarae*, Paraguay: Sapu-
cay, 1901, W. Foster collector.

Other Recorded Distribution: Brazil: ex
Metachirops opossum quica (= *Philander*
opossum quica), and *Nectomys squamipes*.
Argentina: ex *Deltamys benysiparana*, *Oxy-*
mycterus platensis, *Scapteromys tomentosus*,
and *Holochilus balnearum* (= *H. brasiliensis*
balnearum). Peru: ex "wild rat."

VENEZUELAN RECORDS (6 males and 19 females)

There were 3 male and 8 female specimens ex 3
Rhipidomys venezuelae (Dto. Federal), 2 males and
4 females ex 1 *Rhipidomys venustus* (Monagas), and
1 male and 6 females ex *Rhipidomys macconnelli* (Fal-
cón and T. F. Amazonas). In addition 1 specimen each
was collected from *Oryzomys albigularis* in Sucre, and
Akodon urichi in T. F. Amazonas.

REMARKS

The key character given by Johnson (1957)
to separate *C. minerva minerva* from *C. minerva*
wolffhuegeli is the number of spines in
the genal comb: *minerva* has 5 and *wolffhue-*
geli has 7 or 8. Most of our specimens have 6
spines but two or three have only 5 spines.

C. minerva has been collected from a vari-
ety of hosts, including marsupials, but 88% (22
of 25) of our specimens were collected from
Rhipidomys species. All of our specimens were
collected between 1320 and 1500 meters eleva-
tion. This species has been collected at eleva-
tions of 3505 and 4033 meters in Peru.

We have included illustrations of specimens
collected from the same host species to indicate
the variation which occurs in this species.

Genus *Plocopsylla* Jordan

Plocopsylla Jordan, 1931b:138.

Type Species: *Craneopsylla achilles* Roths-
child.

Plocopsylla ulysses Hopkins
(Fig. 65-67, 68c)

Plocopsylla ulysses Hopkins, 1951:529, Fig. 1-4.—
Hopkins and Rothschild, 1956:167-168, Fig.
269-271.—Johnson, 1957:74.

Type Data: Male holotype and female allotype
ex *Thomasonys* species, Ecuador: Chim-
borazo, IV-1931, F. Spillmann collector.

Other Recorded Distribution: None.

VENEZUELAN RECORDS (23 males and 35 females)

There were 20 males and 32 females ex 10 *Thomasonys*
laniger (Mérida and Trujillo), 5 *Thomasonys*
lugens (Mérida), 6 *Thomasonys hylophilus* (Mérida),
and 1 *Thomasonys* sp.¹ (Mérida). The remaining 6
specimens were collected from *Trachops cirrhosus*²
(Guárico), *Oryzomys minutus* (Mérida), *Cryptotis*
thomasi, *Akodon bogotensis*, and a bird³ (Táchira).

REMARKS

Our specimens appear to be sufficiently dif-
ferent from type specimens to warrant descrip-
tion as a new species. However, Smit (1968)
has compared our specimens with the holotype
and assures us they are conspecific. Apparently
the holotype specimen is overcleared and some
aspects of the male terminalia are difficult to
see. In our specimens there is a considerable
amount of variation and there are some aberrant
specimens. For example, there are 2 males
and 3 females with spines on the genal process
(one side only) and there are 3 additional fe-
males with 3 antepygidial bristles on each side.
The female allotype and most of our specimens
have 4 antepygidial bristles per side. In the
male holotype the lateral projection of the clasper
is fairly straight and the apex is truncate
whereas in our specimens the lateral projection
of the clasper is not straight and the apex has
the appearance of the head of a railroad spike
(somewhat like *P. hector*). Also the movable
process of the clasper is not fingerlike as in il-
lustrations given by Hopkins but the apex is
more broadly triangular. The eighth sternum
is well developed as in *P. scotinomi* but the api-
cal half is filamentous.

All but 3 males and 4 females were collected
from species of *Thomasonys*. All of our speci-
mens were collected at elevations in excess of
2300 meters. Of the four species of helmeted
fleas in our collection, each representing a dif-
ferent genus, *P. ulysses* is the most ecologically
restricted in terms of hosts and elevation.

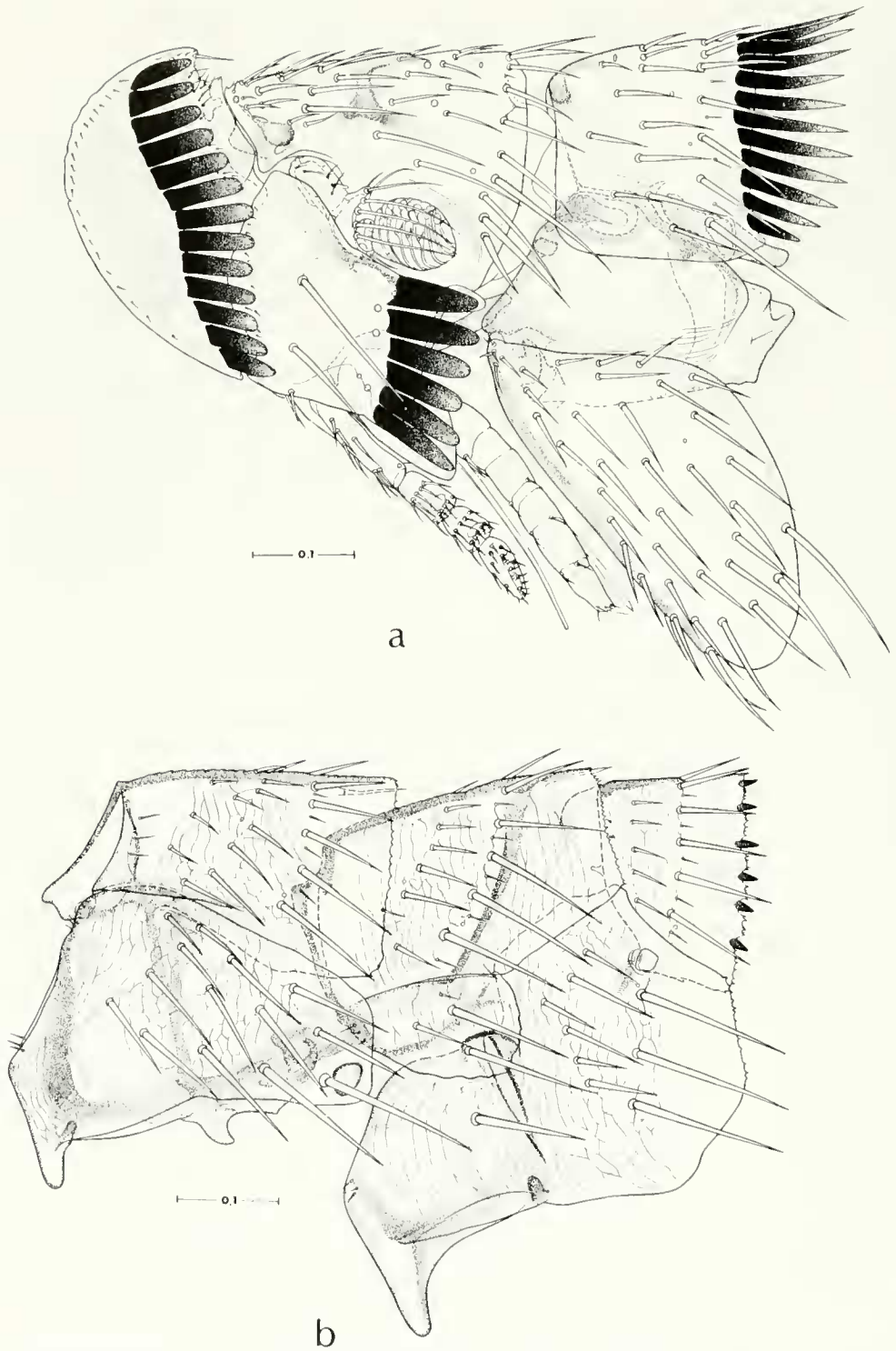


Fig. 61. *Craucopsylla minerva minerva* (Rothschild) ex *Rhipidomys venustus* (SVP 546). Dto. Federal. Male:
 a, head, prothorax and procoxa. b, meso- and metathorax and first abdominal segment.

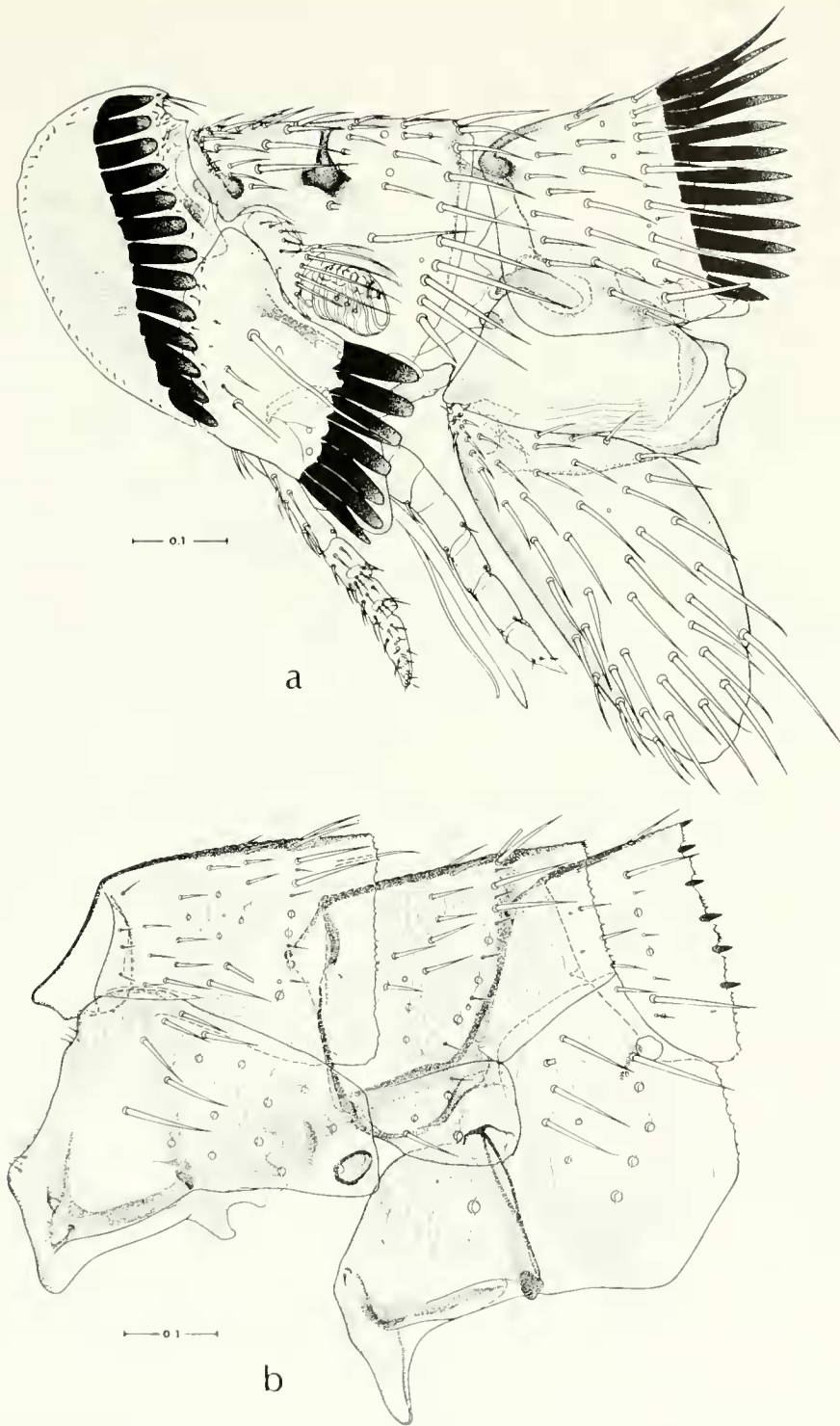


Fig. 62. *Crancopsylla minerva minerva* (Rothschild) ex *Rhipidomys venustus* (SVP 342), Dto. Federal. Male: a, head, prothorax and procoxa. b, meso- and metathorax and first abdominal segment.

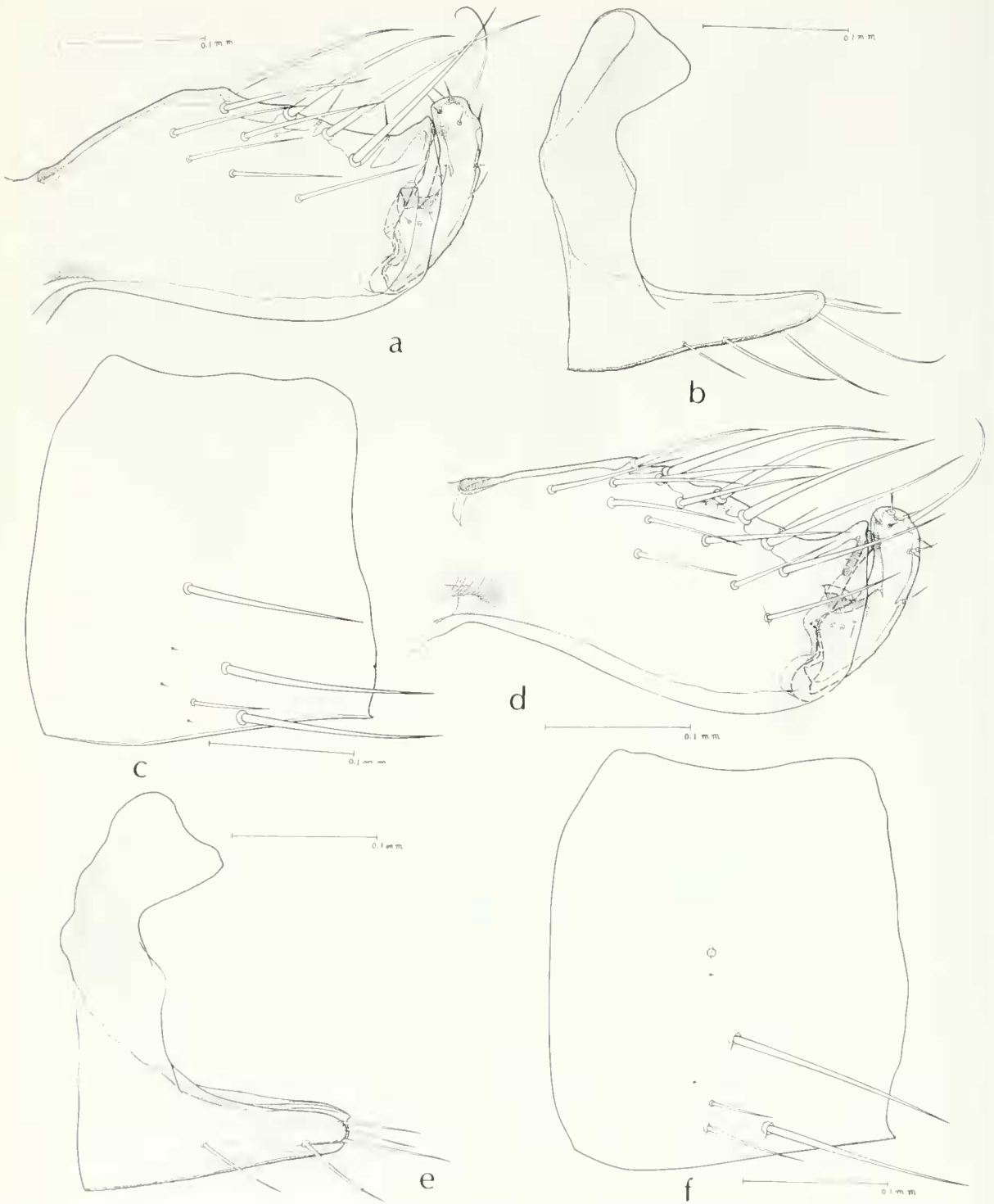


Fig. 63. *Crancopsylla minerva minerva* (Rothschild) ex *Rhipidomys venustus* (SVP 546), Dto. Federal. Male: a, process and movable finger of clasper. b, ninth sternum. c, eighth sternum. (SVP 342), Dto. Federal. Male: d, process and movable finger of clasper. e, ninth sternum. f, eighth sternum.

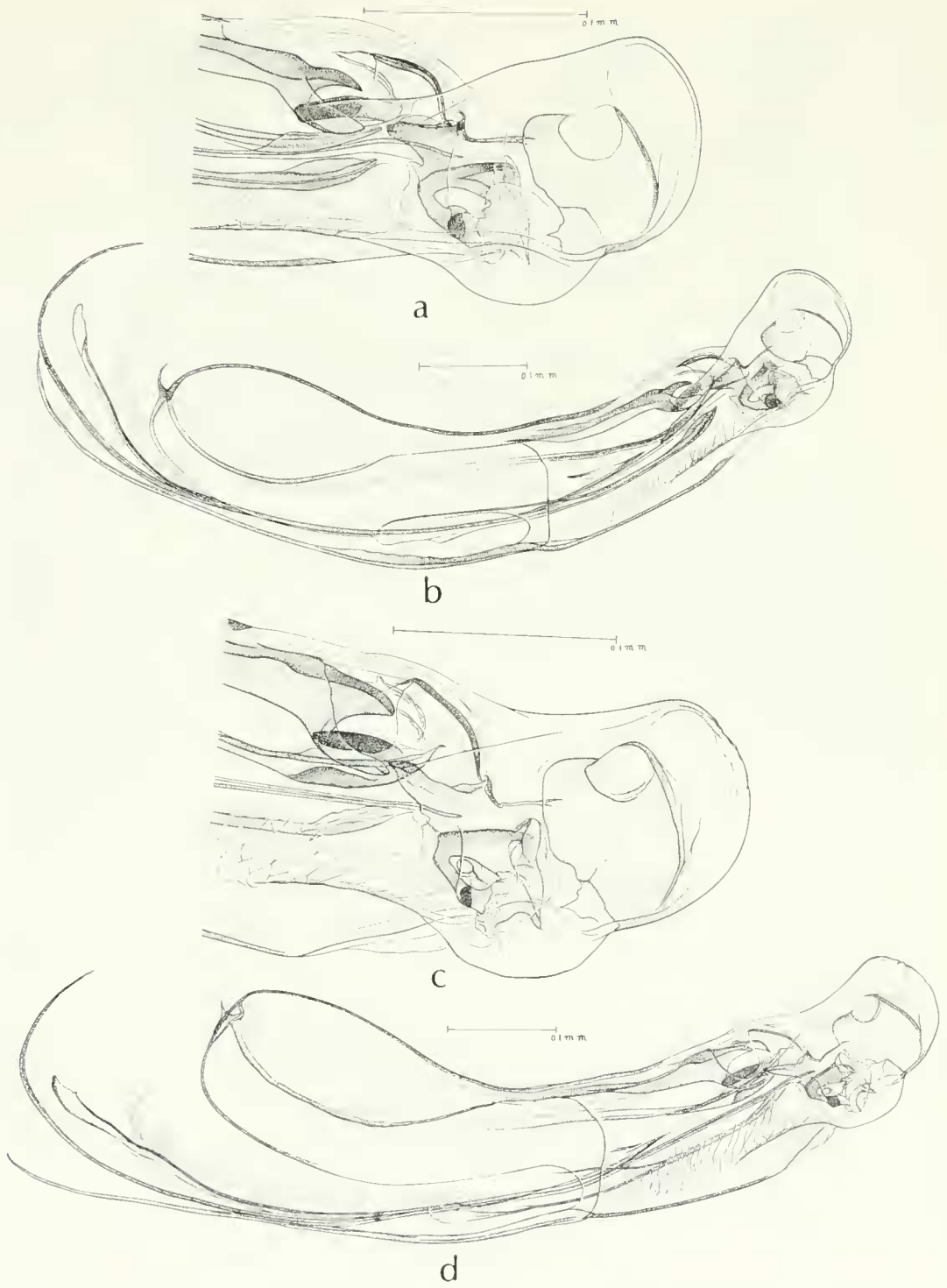


Fig. 64 *Crancopsylla minerva minerva* (Rothschild) ex *Rhipidomys venustus* (SVP 546). Dto. Federal. Male: a, apex of aedeagus. b, aedeagus (SVP 342), Dto. Federal. Male: c, apex of aedeagus. d, aedeagus.



Fig. 65. *Plocopsylla ulysses* Hopkins. Male: a, head, prothorax and procoxa. b meso- and metathorax and first abdominal segment.

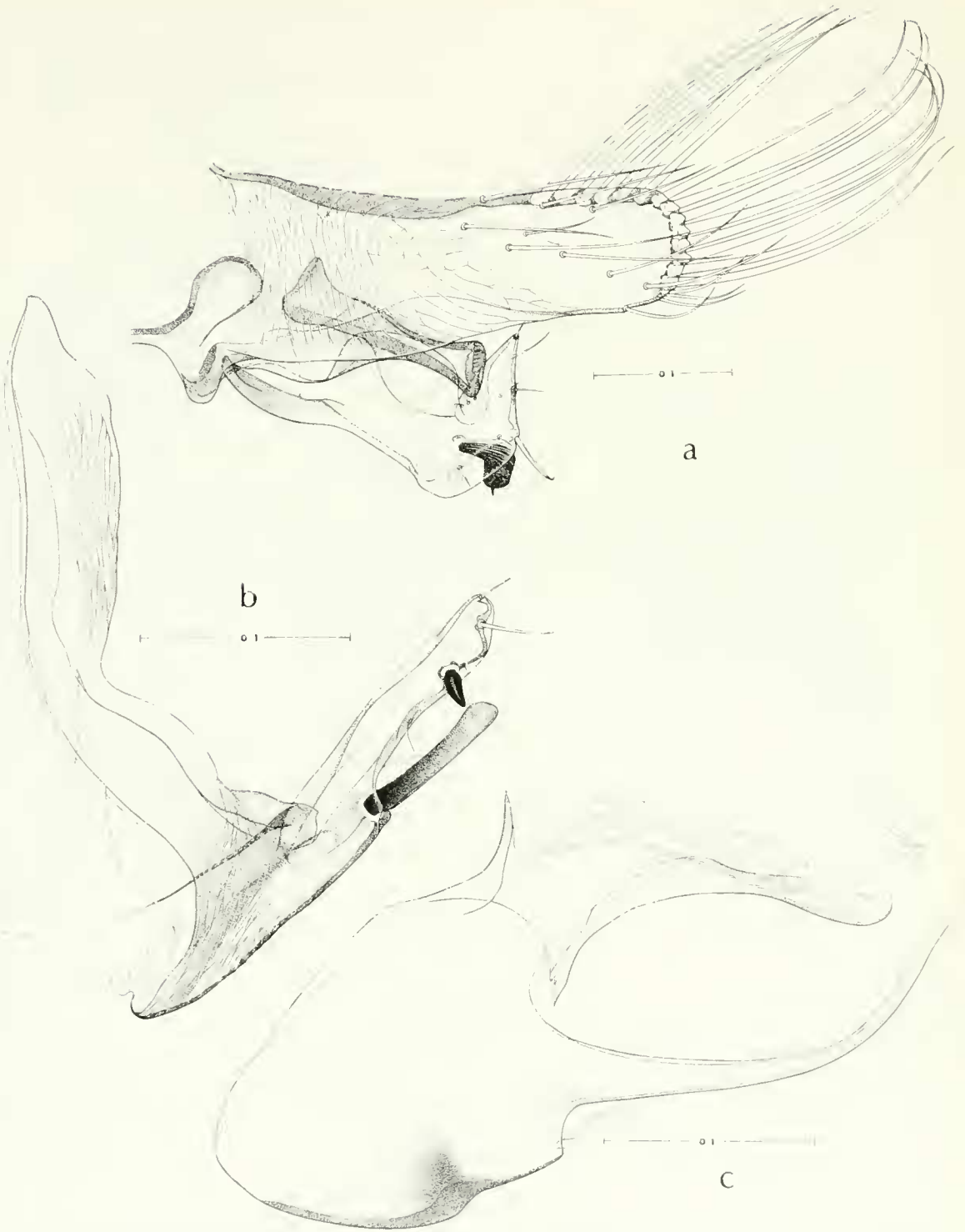


Fig. 66. *Plocopsylla ulysses* Hopkins. Male: a, process and movable finger of clasper b, ninth sternum. c, eighth sternum.

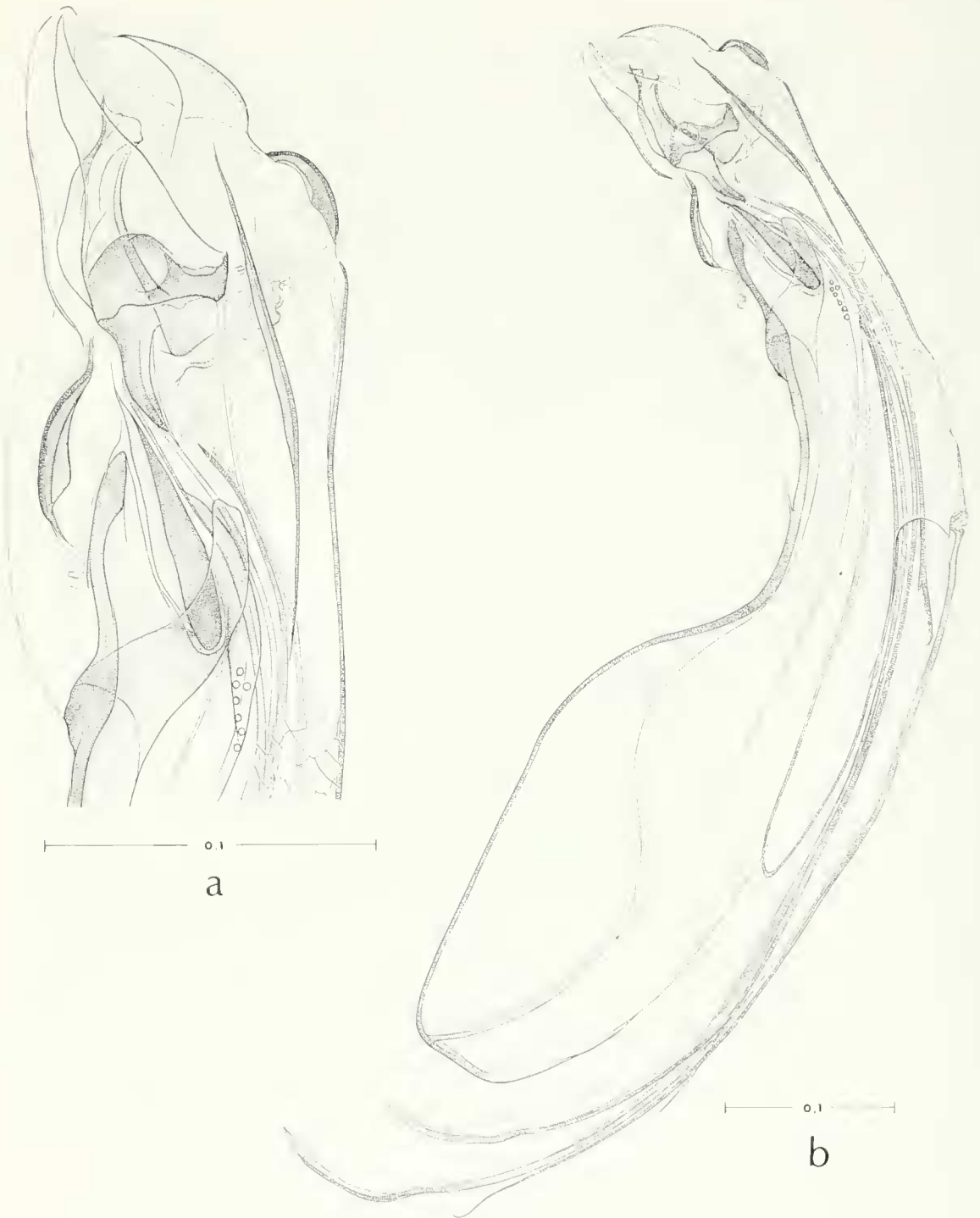


Fig. 67. *Plocopsylla ulysses* Hopkins. Male: a, apex of aedeagus. b, aedeagus.

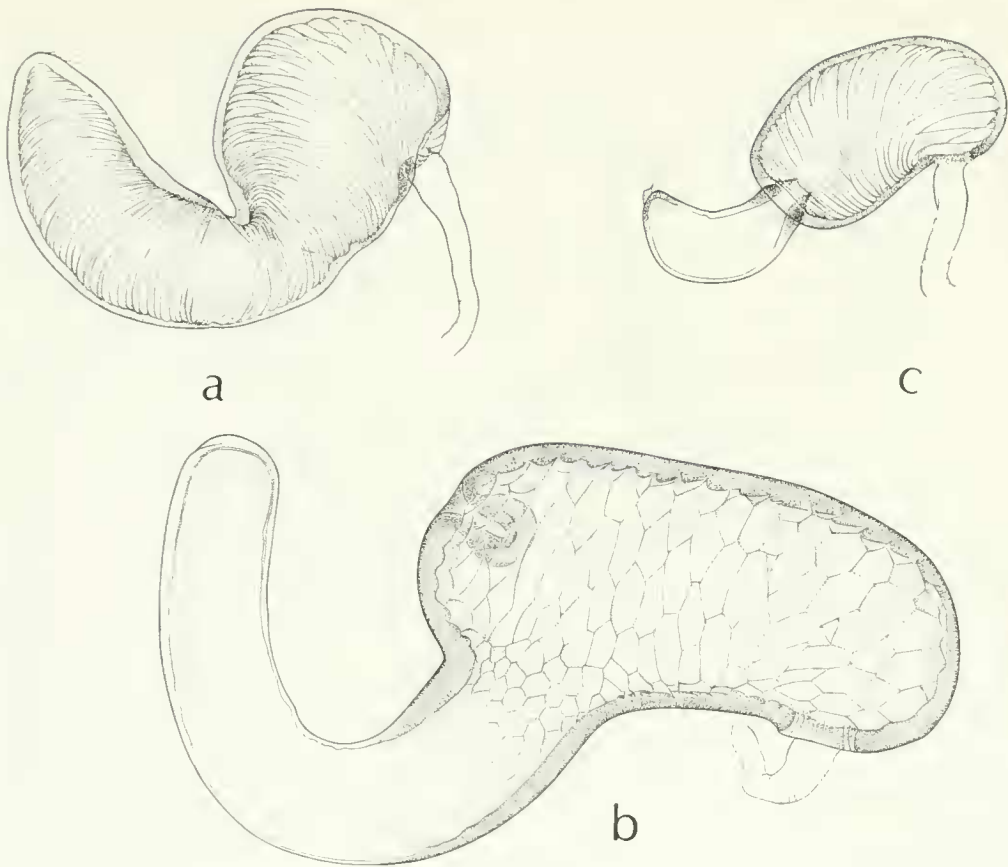


Fig. 68. Females, spermatheca: a, *Cleopsylla monticola* Smit. b, *Craneopsylla minerva minerva* (Rothschild). c, *Plocopsylla ulyssees* Hopkins.

Genus *Sphinctopsylla* Jordan

Sphinctopsylla Jordan, 1931b:141.

Type Species: *Craneopsylla tolmera* Jordan.

Sphinctopsylla tolmera (Jordan)

(Fig. 69-71)

Craneopsylla tolmera Jordan, 1931a:314, Fig. 5.

Sphinctopsylla tolmera, Jordan, 1931b:141, Fig. 10.—Smit, 1955:324.—Johnson, 1957:69.

Type Data: Male holotype ex *Neomys*² species, Ecuador: Prov. of Pichincha, 23-XII-1930, F. Spillmann collector.

Other Recorded Distribution: Ecuador: ex *Oryzomys* species and *Thomasomys* species. Colombia: ex *Chilomys instans* and *Thomasomys laniger*.

VENEZUELAN RECORDS (36 males and 76 females)

There were 32 males and 63 females ex 38 *Oryzomys minutus* in Mérida at 3122-3785 meters elevation and 8 *O. minutus* in Táchira at 2370-2418 meters

elevation. An additional 4 males and 13 females were collected from *Thomasomys laniger* and *Akodon bogotensis* (Mérida); *Oryzomys albicularis*, *Cacnolestes obscurus*, *Rhipidomys venustus*, and *Thomasomys hylophilus* (Táchira), and *Oryzomys fulvescens* (Táchira and Yaracuy). Also there were 4 specimens for which the host data and locality had been lost.

REMARKS

Hopkins and Rothschild (1956) indicate there are 15 spines in the helmet comb, 5 spines in the genal comb and 30 spines in the pronotal comb. All of our specimens have 17 spines in the helmet comb, 5 spines in the genal comb and 30 spines in the pronotal comb with the following exceptions: helmet comb—there are 12 males and 5 females with 16 spines, and 1 male and 3 females with 18 spines; pronotal comb—4 males and 6 females have 28 spines, 4 males and 11 females have 32 spines, and 3 females have 34 spines. There may not be as much variation in the pronotal comb as our counts indicate because the orientation of some specimens makes accurate counting difficult.

Our specimens were collected between 2370 and 3785 meters elevation, but more than 80%

²This is probably an error as *Neomys* does not occur in the new world

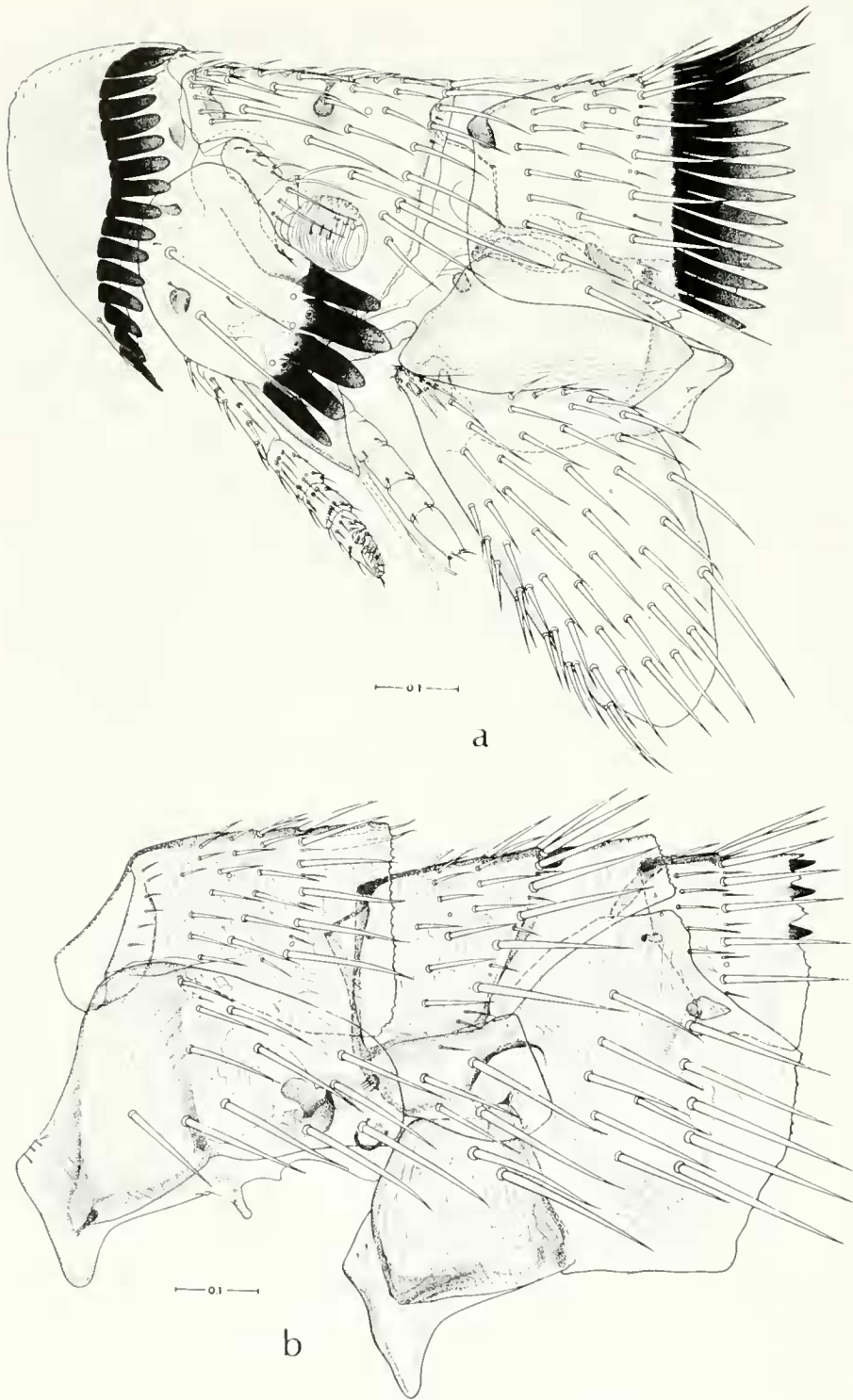


Fig. 69. *Sphinctopsylla tolmera* (Jordau). Male. a. head prothorax and procoxa. b. meso- and metathorax and first abdominal segment.

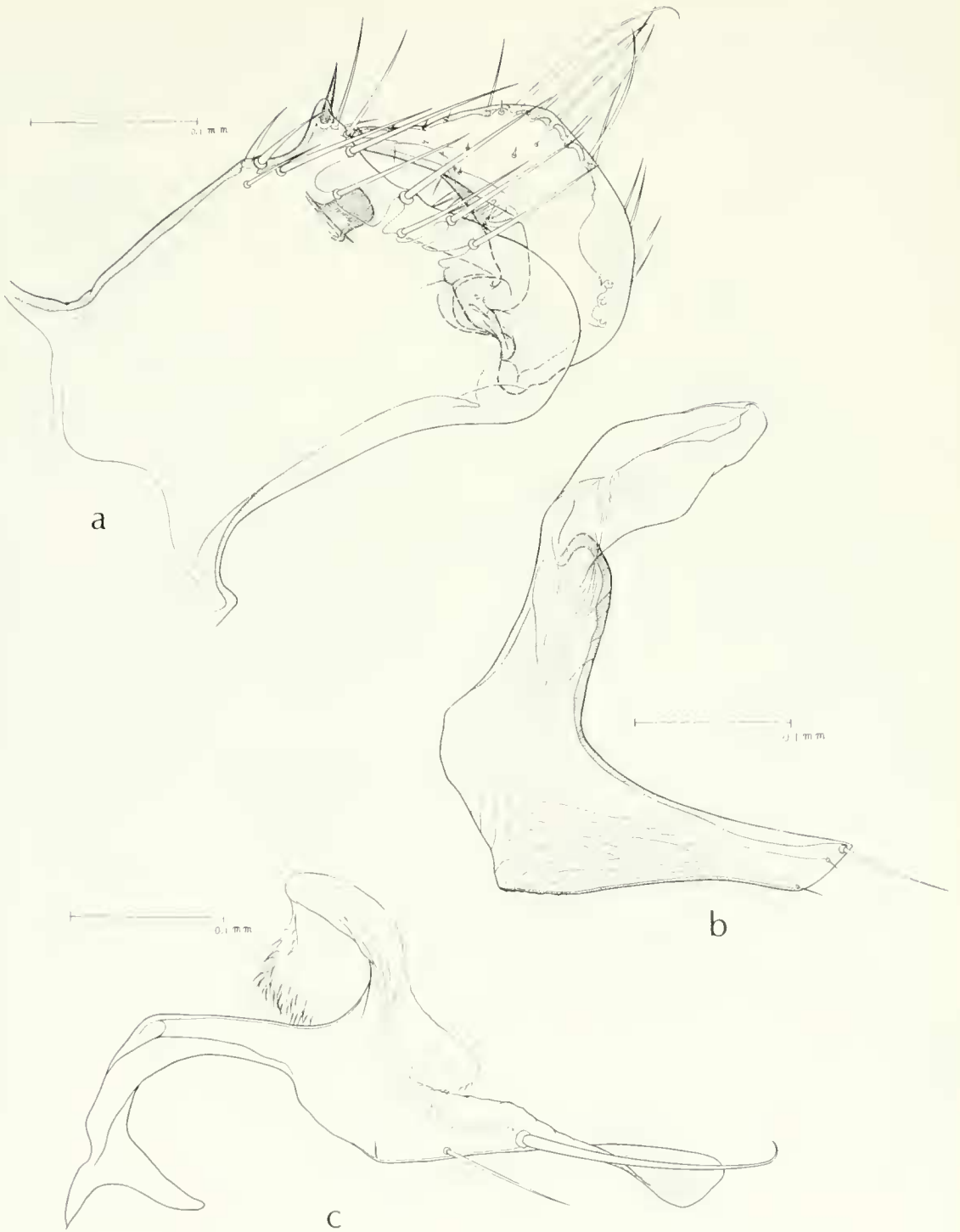


Fig. 70. *Sphinctopsylla tolmera* (Jordan). Male: a, process and movable finger of clasper. b, ninth sternum. c, eighth sternum.

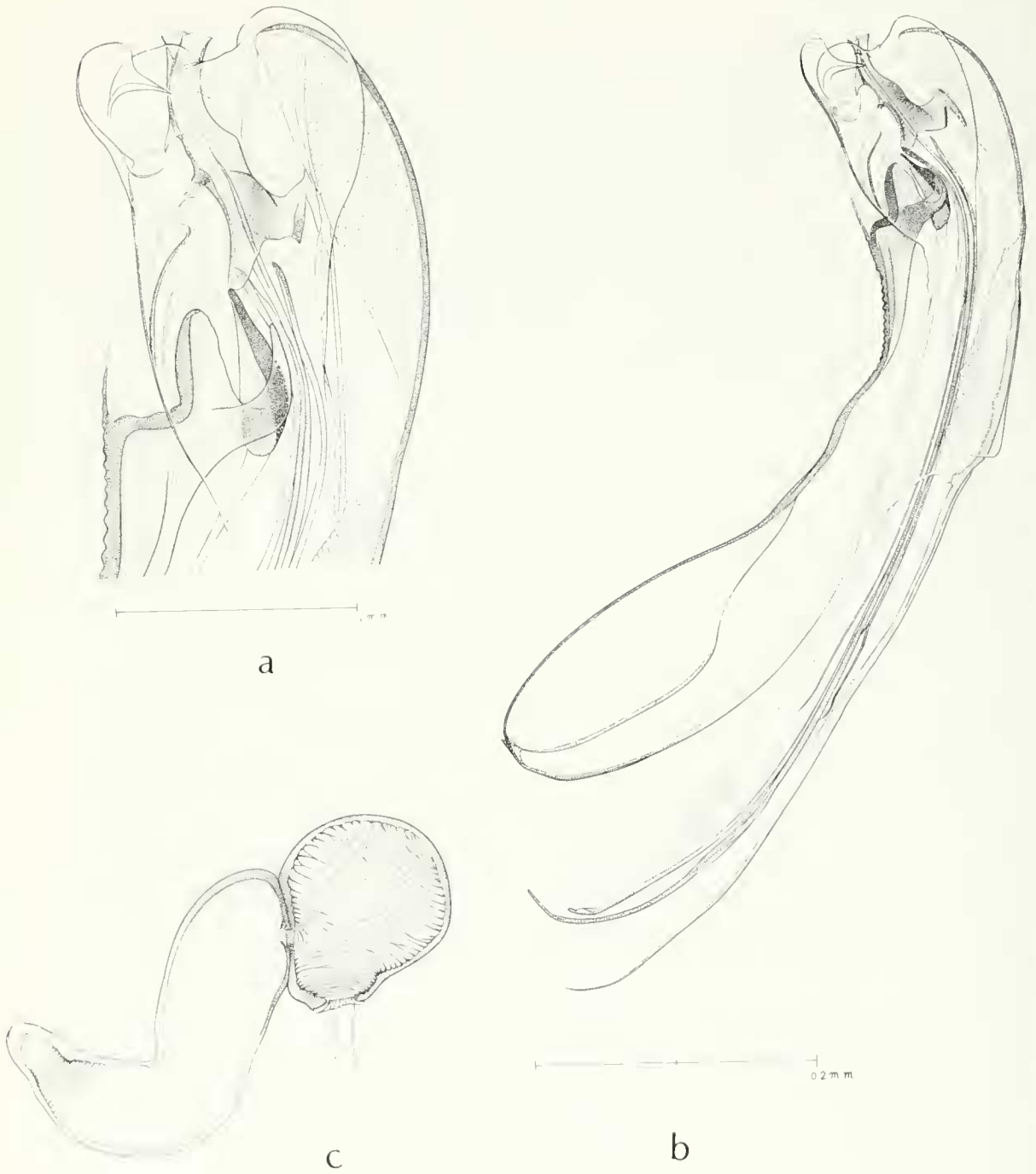


Fig. 71 *Sphinctopsylla toluera* (Jordan). Male: a, apex of aedeagus. b, aedeagus. Female: c, spermatheca.

were collected over 3000 meters elevation. Although *S. tolmera* has been collected from several host genera, more than 87% of our specimens were collected from *Oryzomys* species, principally *O. minutus*.

Family Ichnopsyllidae

Genus *Hormopsylla* Jordan and Rothschild

Hormopsylla Jordan and Rothschild, 1921b:158.

Type species: *Ceratopsylla fosteri* Rothschild.

Hormopsylla cryptica, new species

(Fig. 72-74)

DIAGNOSIS

Hormopsylla cryptica, new species, is very near *H. fosteri* (Rothschild) but the male genitalia differs considerably. In the eighth sternum the apex is truncate, not rounded; there is a well-developed proximal lobe (resembling the proximal lobe of the ninth sternum characteristic of species in other families) shaped like a fishtail; the movable process of the clasper is broadly truncate rather than triangular and the shapes of the crochet and median dorsal lobe are quite different in the two species.

DESCRIPTION

Head (Fig. 72a): Anterior margin evenly rounded; preantennal area covered with about 48 short, spiniform bristles plus four longer bristles; prominent mesal sclerotization running parallel with anterior margin of head; vertical incassation extending ventrad from dorsal margin. Two genal teeth; anterior tooth broad, about two-thirds length of narrower tooth; preoral tuber distinct. Genal process long, extends well beyond apex of antenna; reticulate; apex rounded. Eye small, lightly pigmented, scarcely discernible. Postantennal area with 5 bristles; 4 vertical incassations between rows of bristles, middle 2 most pronounced, apices globular; diagonal row of bristles along antennal fossa; pale, mesal, triangular area with 5 fairly long and 2 or 3 smaller bristles.

Thorax (Fig. 72a, b): Pronotum with 3 rows of bristles arranged 4-3-5; last row with ventral bristle much longer than others, with 5 intercalaries; about 24 teeth in pronotal comb which curves cephalad on ventral end. Mesonotum with 6 rows of bristles, 3 to 4 bristles per row; 5 prominent vertical incassations extending ventrad from dorsal margin. Mesepimere with mesal row of 3 long bristles; about 5 additional smaller bristles. Mesepisternum divided by broad horizontal band; 1 long, 5 shorter bristles above

band; lower portion devoid of setae. Meta-notum with 5 dorsal incassations; 4 rows of marginal-submarginal bristles plus 2 moderately long and 2 short bristles; apex with comb of about 7 teeth per side.

Legs: Procoxa with about 36 mesal bristles plus marginals; 1 long bristle in caudoventral angle; profemur with 3 small bristles on outer lateral surface. Meso-, metacoxae with heavily sclerotized internal rods. Hind tibia with 8 dorsocaudal notches with bristles arranged 2-2-1-2-2-1-2-2. Tarsal segment lengths in microns: 155, 125, 98, 60, 112; 4 pairs lateral plantar bristles.

Abdomen: Terga 1-4 with well-developed combs with teeth numbering 20-18-16-16; 5 bristles per segment, ventral pair with spiracle between them. Minute bristle at base of single, long antepygidial bristle. Sterna with darkened, heavily sclerotized areas near ventral margins; 1 bristle per sternum.

Modified Abdominal Segments, Male (Fig. 73): Tergum 8 with 4 stout bristles caudad of sensillum; caudal margin rounded. Sternum 8 with well-developed caudal process bearing about 6 medium bristles plus 7 or 8 small bristles on ventral margin; apex subtruncate, undulating dorsal margin; striated; appears to have longitudinal fold with well-developed proximal arm, apex like a fishtail. Distal arm of ninth sternum (DA9) with lobe on caudoventral margin bearing 1 short seta; apex funnellike; 2 small marginal setae plus 1 mesal bristle about midway between lobe and apex; dorsal margin concave. Immobile process of clasper (P.) broadly truncate; apex reaches dorsad of midpoint of movable process of clasper (F.); F. prominent, with 2 medium bristles on or near dorsal margin plus 9-10 smaller mesal bristles; point of articulation with P medial.

Aedeagus (Fig. 74): Aedeagal apodeme long, slender, swordlike; with upturned, acuminate apex; proximal spur prominent; apex angular. Median dorsal lobe ovoid, membranous flap somewhat troughlike. Lateral lobes with ventrocaudal margin rounded. Crochet very broad basally; width reduced abruptly at apex, slightly sinuous, acuminate.

Type Data: Male holotype ex *Eptesicus brasiliensis* (SVP 6634); T. F. Amazonas, 84 km SSE Esmeralda near Boca Mayaca, 185 m elev.; 13-II-1966; Tuttle team collector. One paratype male ex *Tadarida gracilis* (SVP 6657) same locality and collectors but 16-II-1966. One paratype male ex *Molossus major* (SVP 9290); Bolívar, 59 km SE El Dorado near El Manaco, 150 m elev., 13-VI-

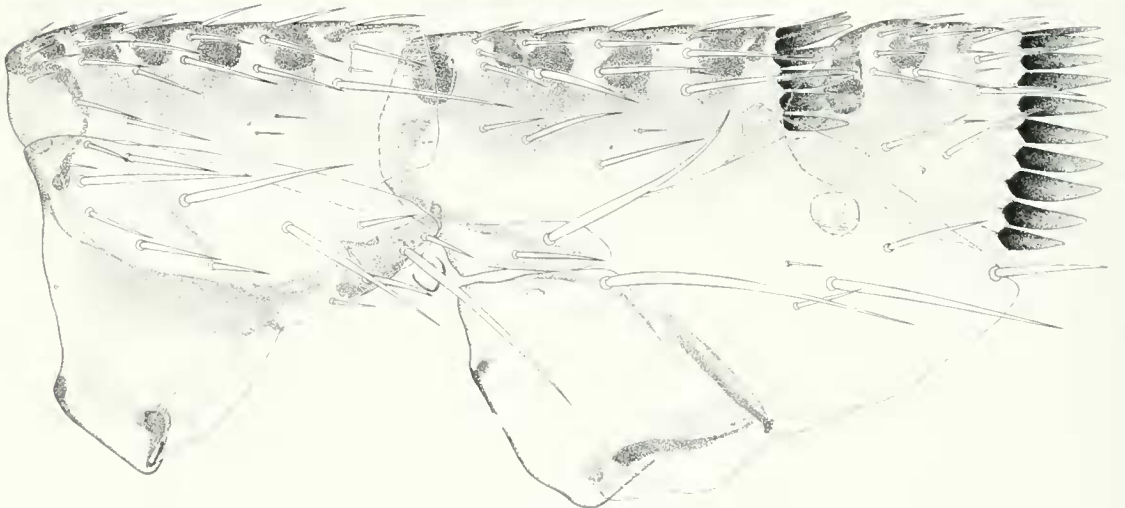
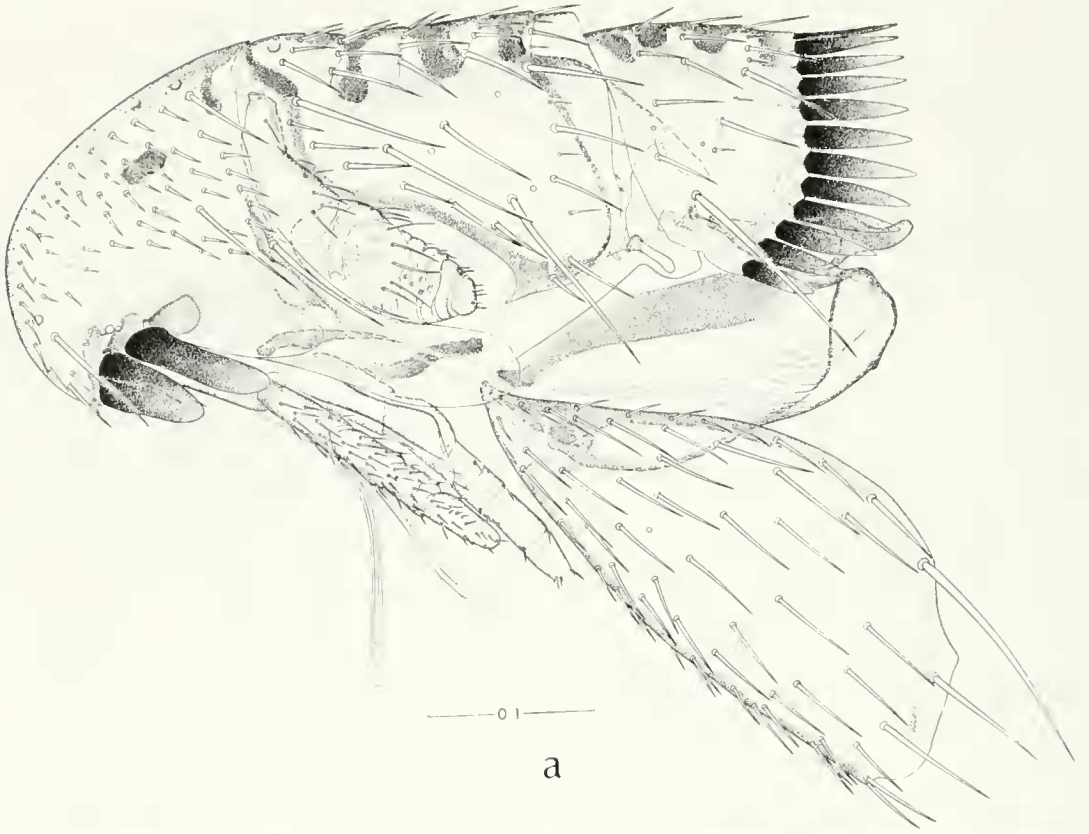


Fig. 72. *Hormopsylla cryptica*, new species. Male: a, head, prothorax and procoxa. b, meso- and metathorax and first abdominal segment.

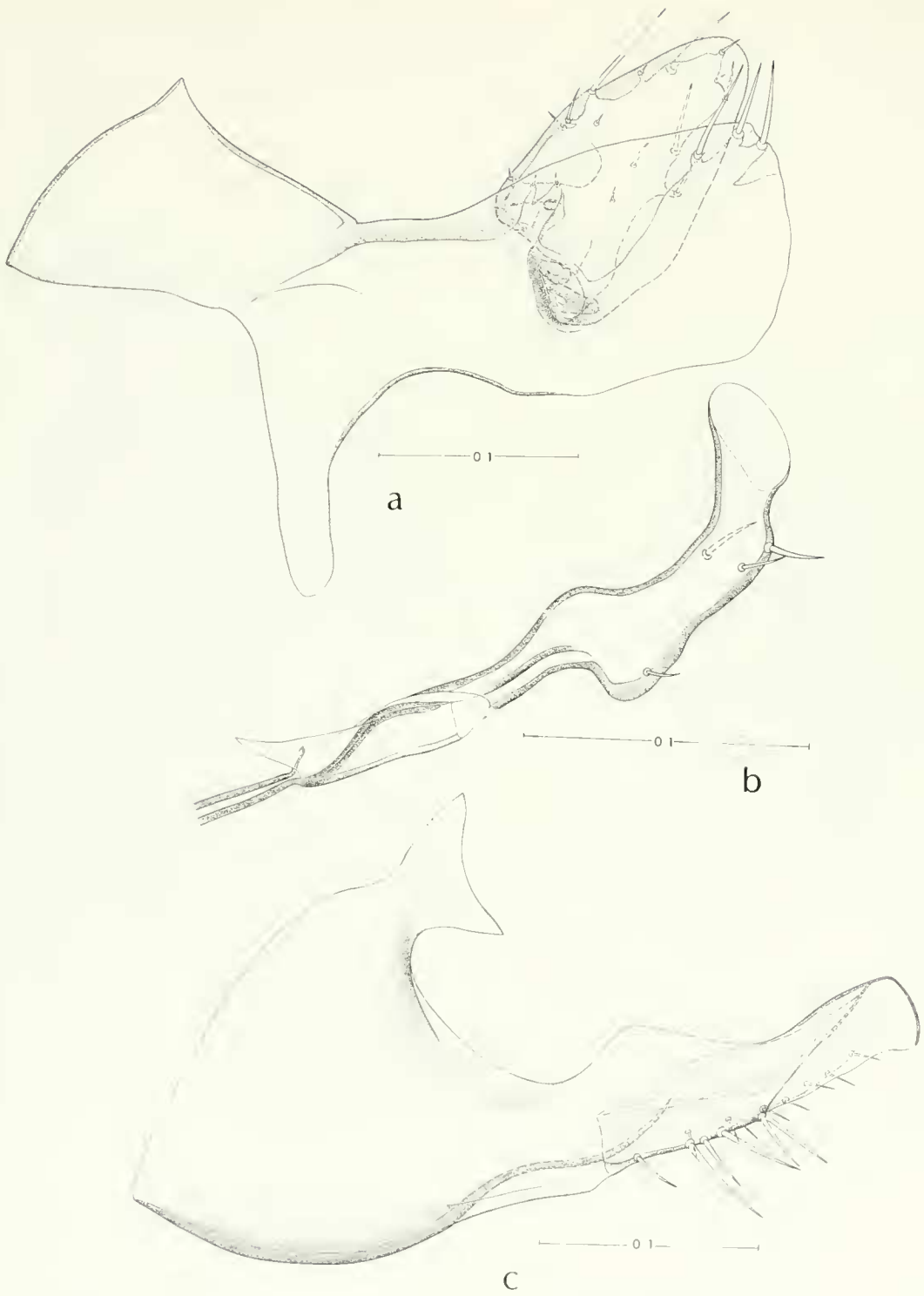


Fig. 73. *Hormopsylla cryptica*, new species. Male: a, process and movable finger of clasper. b, ninth sternum. c, eighth sternum.

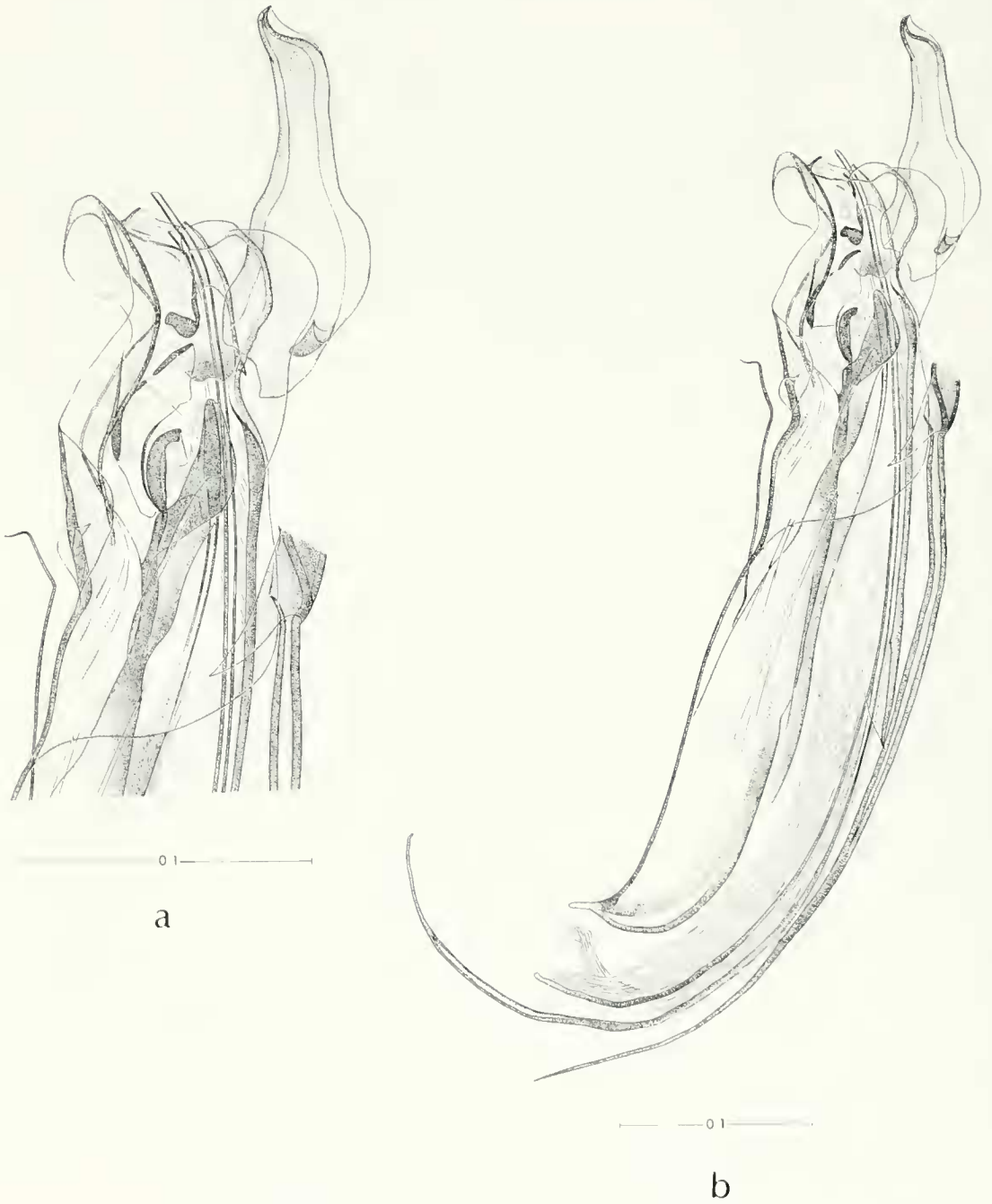


Fig. 74. *Hormopsylla cryptica*, new species. Male: a, apex of aedeagus. b, aedeagus.

1966: Tuttle team collector. Holotype deposited in the collection of the U. S. National Museum, one paratype in the British Museum and one paratype in the collection of the junior author.

Genus *Myodopsylla* Jordan and Rothschild

Myodopsylla Jordan and Rothschild, 1911:88.

Type Species: *Ceratopsylla insignis* Rothschild

Myodopsylla wolffsohni salvasis Jordan
(Fig. 75-78)

Myodopsylla wolffsohni salvasis Jordan, 1931c: 264, Fig. 1.—Guimarães, 1940:220, Fig. 1.—Hopkins and Rothschild, 1956:241-242, Fig. 400; Pl. 18f, 26.—Johnson, 1957:97.—Barrera and Diaz-Ungria, 1957:164, 181.—Machado-Allison, 1966:26, 28.

Type Data: Male holotype ex "bat," Venezuela: State of Mérida, VI-1930, A. Hase collector; 1 male and 3 females ex *Myotis* species, Puerto La Cruz, (6 miles NNE Barcelona), VI-1930, A. Hase collector.

Other Recorded Distribution: None.

VENEZUELAN RECORDS (9 males and 32 females)

There were 4 males and 23 females ex 4 *Myotis keaysi* in Aragua and 7 *M. keaysi* in Miranda. Fourteen specimens were collected from 2 *Myotis oxyotis* in Mérida and 3 *Myotis nigricans* in Monagas.

REMARKS

All of our specimens of *M. wolffsohni salvasis* were collected above 950 meters, primarily on bats of the genus *Myotis*, especially *M. keaysi* and to a lesser extent on *M. nigricans* and *M. oxyotis*. The degree of sclerotization of the crochet is variable which probably influences folding and distortion of this structure and causes it to be highly variable in form. The apical lobe of the distal arm of the ninth sternum also tends to be variable. There are 10-12 bristles on the apical margin of the eighth sternum, but in most specimens there are 12.

Genus *Ptilopsylla* Jordan and Rothschild

Ptilopsylla Jordan and Rothschild, 1921b:158-160.

Type Species: *Ptilopsylla leptina* Jordan and Rothschild.

Ptilopsylla leptina Jordan and Rothschild

Ptilopsylla leptina Jordan and Rothschild, 1921b: 160-162, Fig. 142-147.—Guimarães, 1942:

202.—Costa Lima and Hathaway, 1946:175.—Hopkins and Rothschild, 1956:206, Fig. 351-356.—Johnson, 1957:98.

Type Data: Male holotype ex "bat," Paraguay: Santissima Trinidad (suburb of Asunción), L. Zurcher collector.

Other Recorded Distribution: Brazil: ex *Darius albiventer* (= *Noctilio labialis albiventer*) and *Tadarida curops* (= *T. gracilis*).

VENEZUELAN RECORDS (1 male)

One male (SVP 15707) ex *Tadarida gracilis*, near Belén and Río Cunucumuma, T. F. Amazonas, 185 m elev., 13-1-1967, Tuttle team collector.

REMARKS

P. leptina is said to be "rare" as it has been collected only on four occasions, including our single specimen collection. We have examined several hundred molossid bats but only one was parasitized with this flea. Molossid bats often roost in the space between roof tile and the ceiling and thus are very close to guano deposits. We suggest that fleas of the genus *Ptilopsylla* have adapted to this habitat and are on the host only for short periods while feeding.

Genus *Rothschildopsylla* Guimarães

Rothschildopsylla Guimarães, 1953:109-110.

Type Species: *Ichnopsyllus noctilionis* Costa Lima.

Rothschildopsylla noctilionis (Costa Lima)
(Fig. 79-82)

Ichnopsyllus noctilionis Costa Lima, 1920:56, Fig. 1-2.

Hormopsylla noctilionis, Pinto, 1930:357.—Costa Lima, 1938:186.—Costa Lima and Hathaway, 1946:172.

Ptilopsylla noctilionis, Hopkins, 1952:364.

Rothschildopsylla noctilionis, Guimarães, 1953: 109-110.—Hopkins and Rothschild, 1956:210-211, Fig. 359-361; Pl. 21A.—Johnson, 1957: 99.—Machado-Allison, 1966:28.

Type Data: Ex *Noctilio albiventer* Spix (= *N. labialis albiventer*), Brazil: State of Mato Grosso, Corumba, A. de Miranda Ribeiro collector.

Other Recorded Distribution: None.

VENEZUELAN RECORDS (1 male and 2 females)

One female (SVP 6598) ex *Tadarida gracilis*, Boca Mavaca, 84 km SSE Esmeralda, Amazonas, 185 m elev., 14-11-1966, Tuttle team collector. One male (SVP 6657) and 1 female (SVP 6658) ex *Tadarida gracilis*, same locality but 16-11-1966.

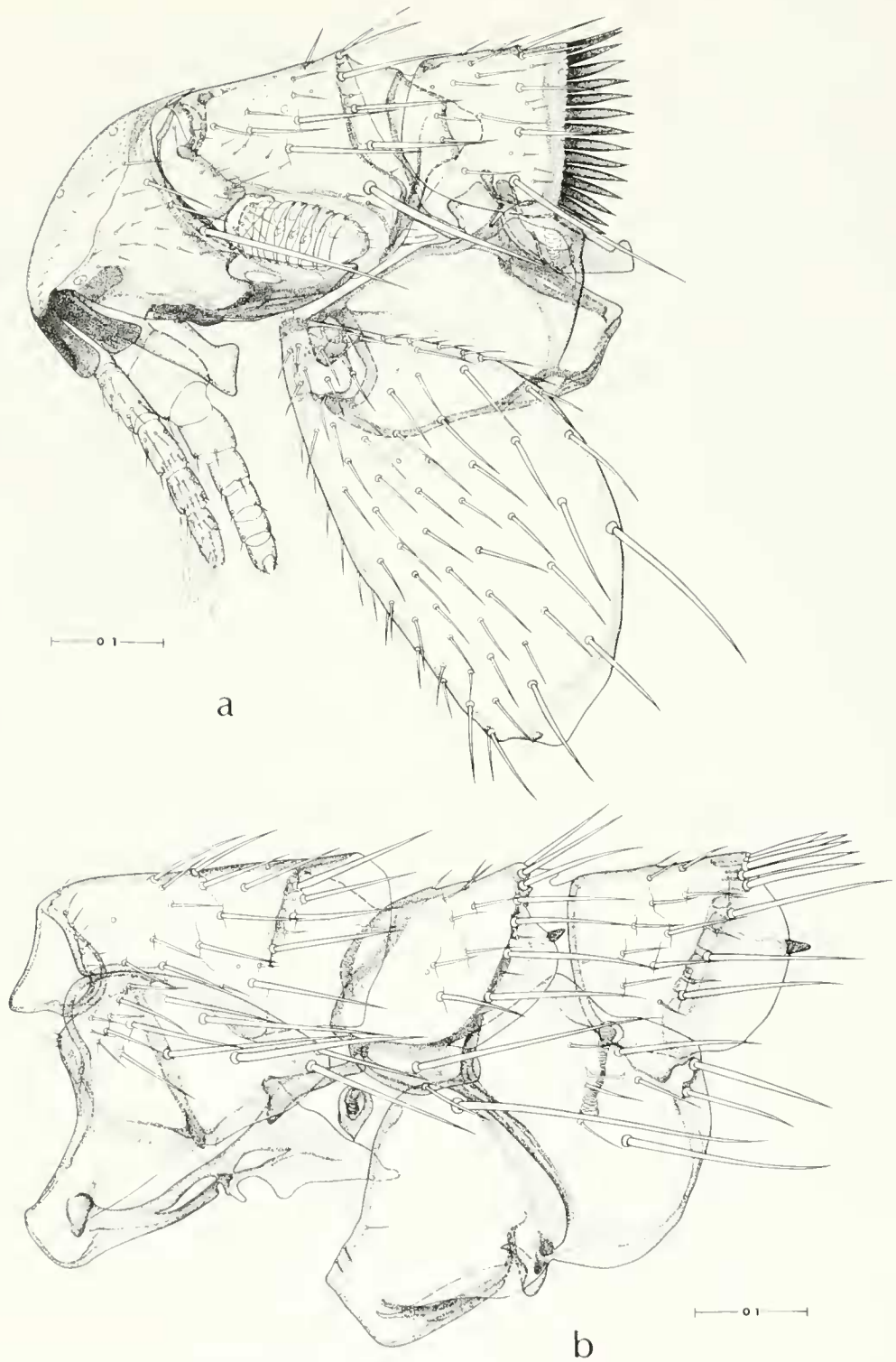


Fig. 75. *Myodopsylla wolffsohni saltrasis* Jordan, Male: a, head, prothorax and procoxa. b, meso- and meta-thorax and first abdominal segment.

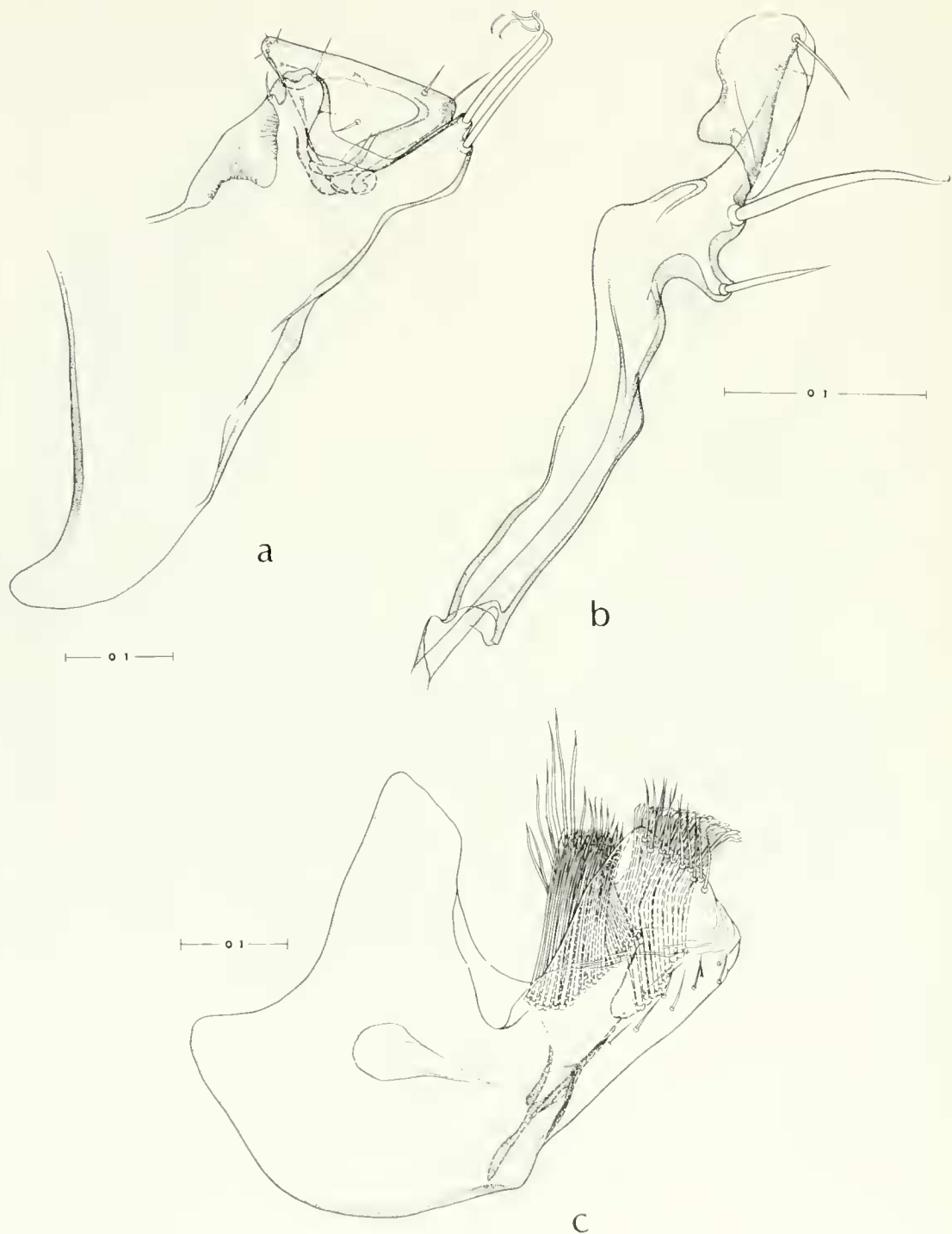


Fig. 76. *Myodopsylla wolffsohni salvasis* Jordan, Male: a, process and movable finger of clasper. b, ninth sternum. c, eighth sternum.

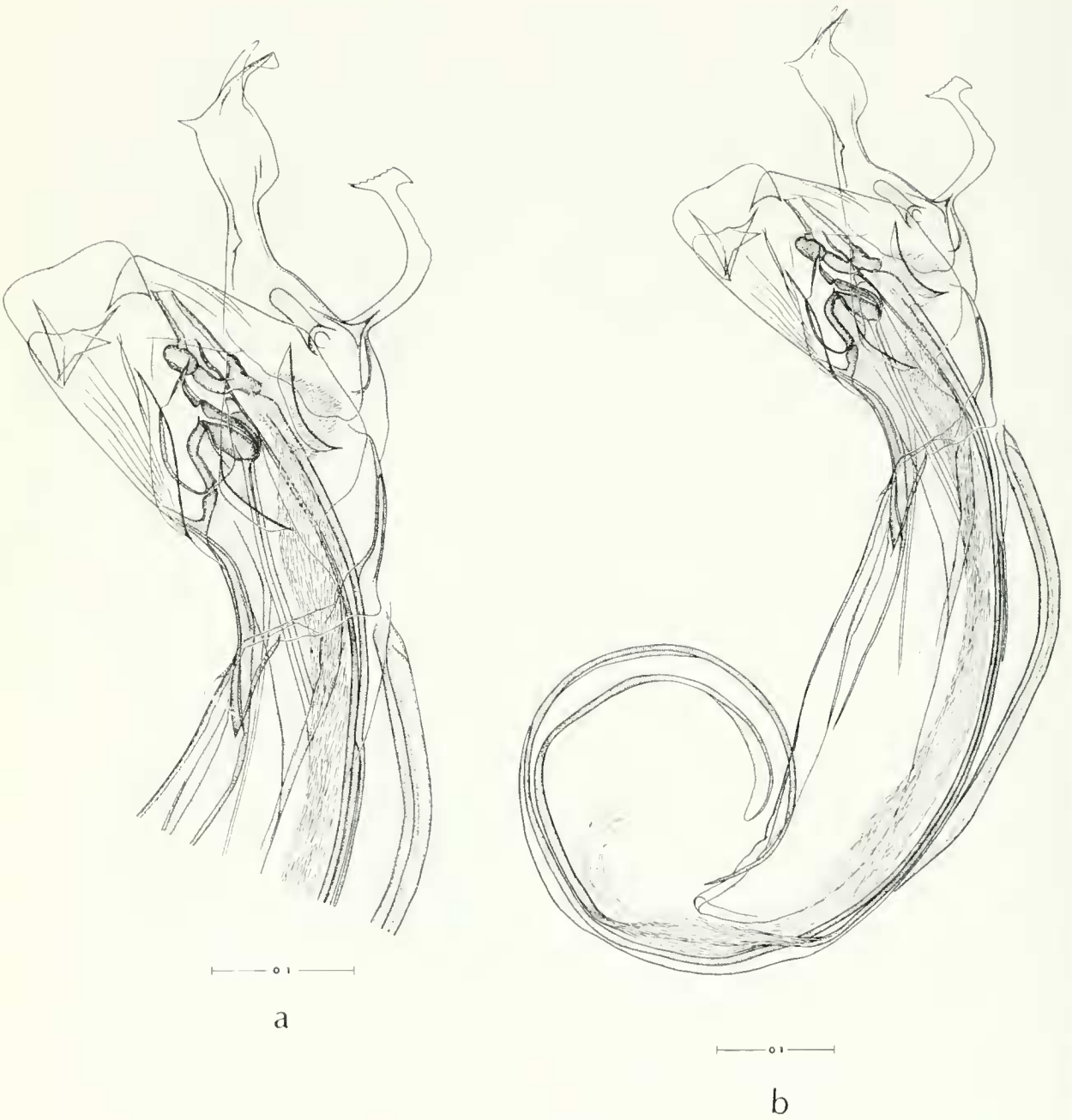


Fig. 77. *Myodopsylla wolffsohni salvasis* Jordan. Male: a, apex of aedeagus. b, aedeagus.

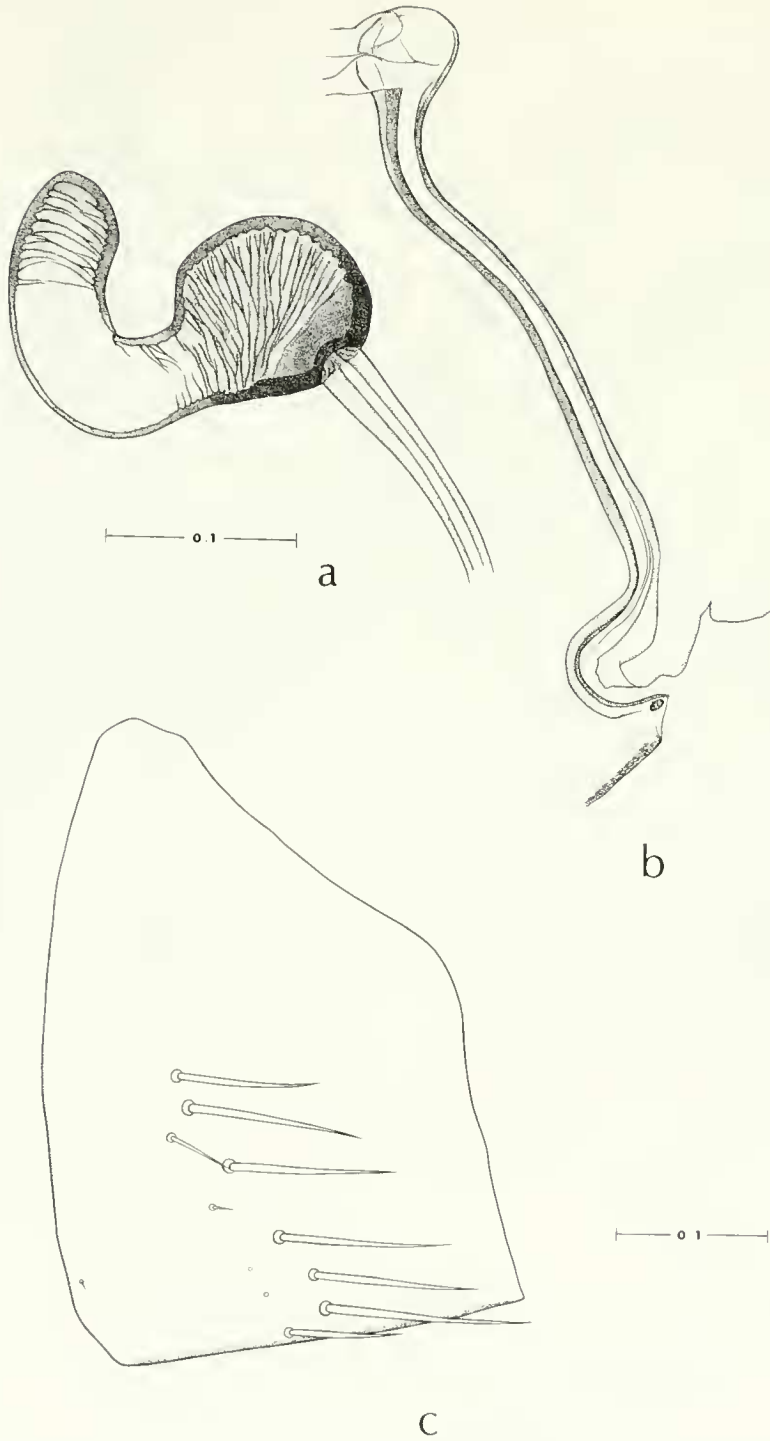


Fig. 78. *Myodopsylla wolffsohni salvasis* Jordan. Female: a spermatheca. b, bursa copulatrix. c, seventh sternum.

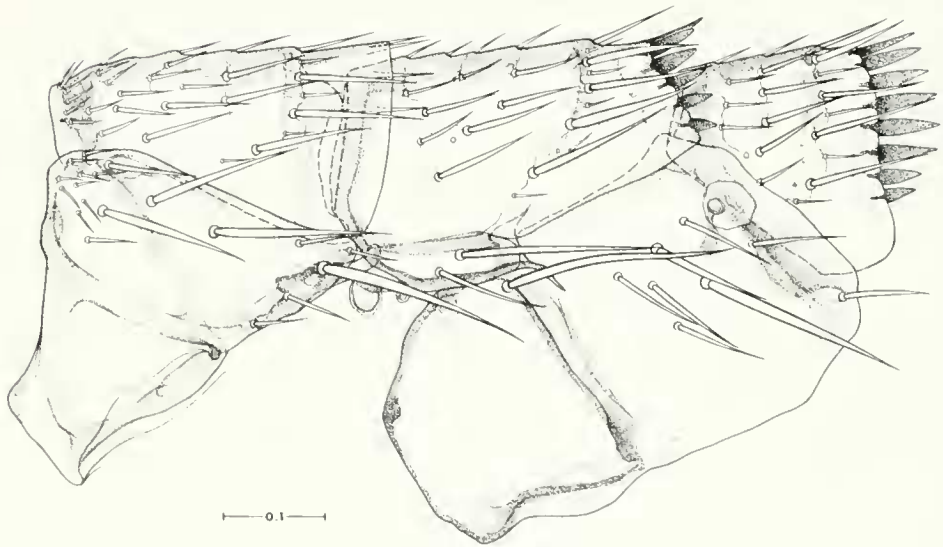
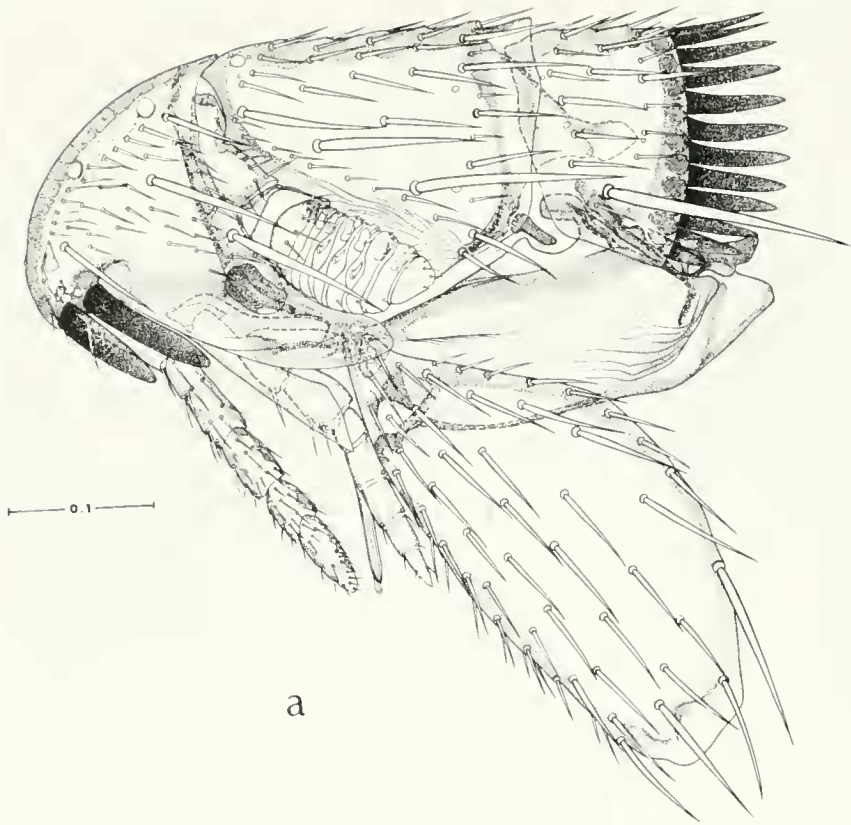


FIG. 79. *Rothschildopsylla noctilionis* (Costa Lima). Male: a, head, prothorax and procoxa. b, meso- and metathorax and first abdominal segment.

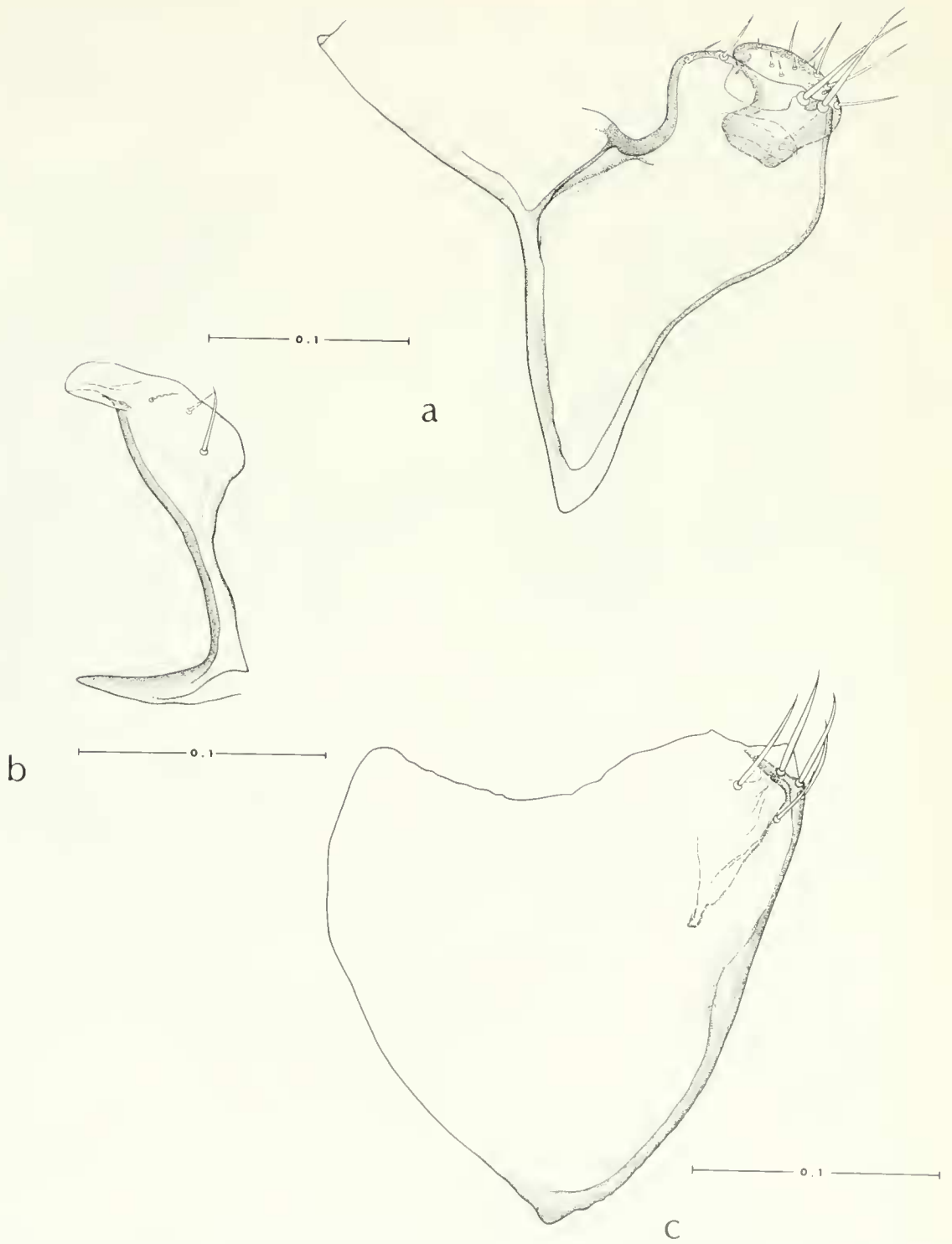


Fig. 80. *Rothschildopsylla noctilionis* (Costa Lima). Male: a, process and movable finger of clasper. b, ninth sternum. c, eighth sternum.

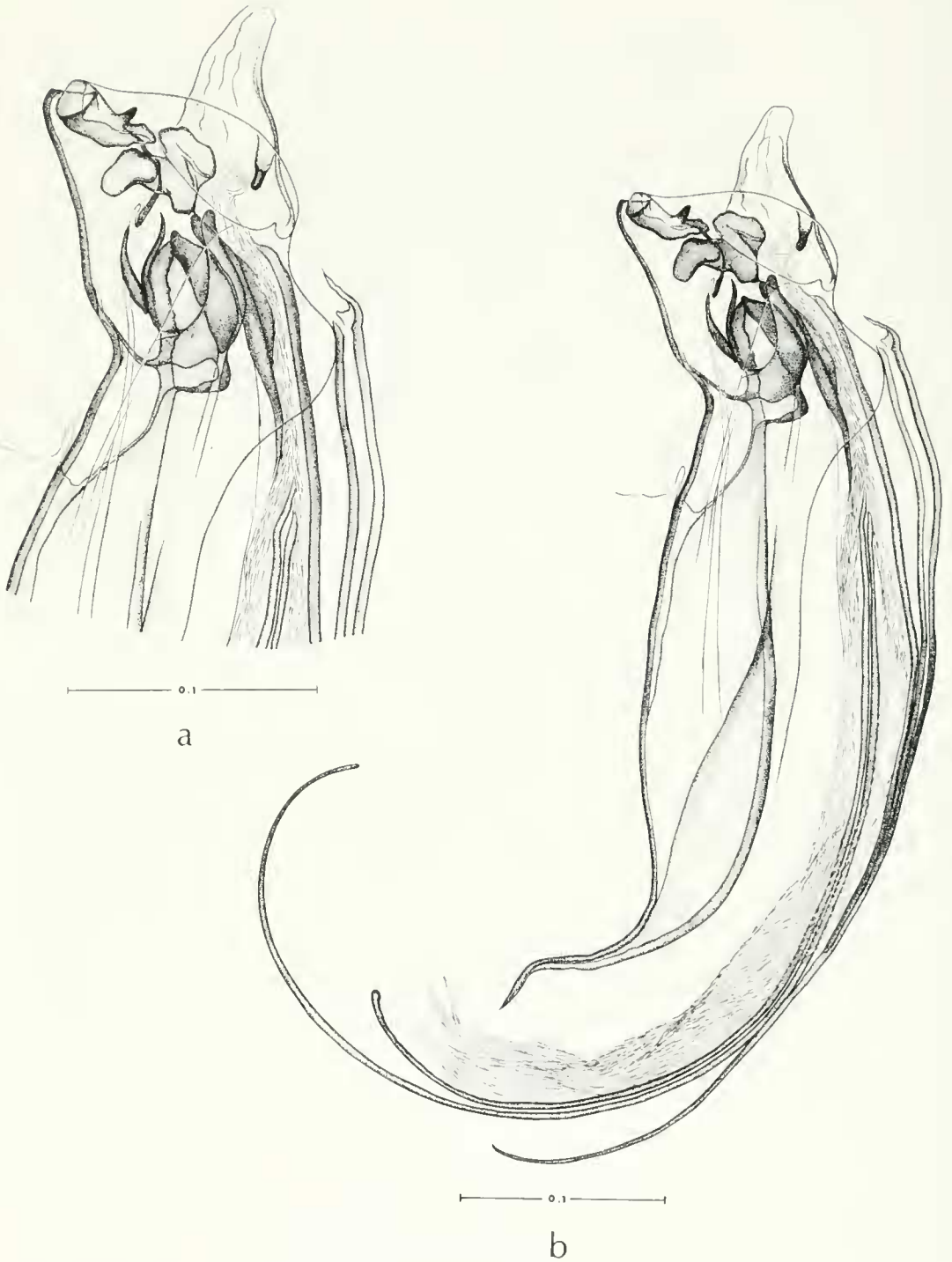


Fig. 81 *Rothschildopsylla noctilionis* (Costa Lima). Male: a, apex of aedeagus. b, aedeagus.

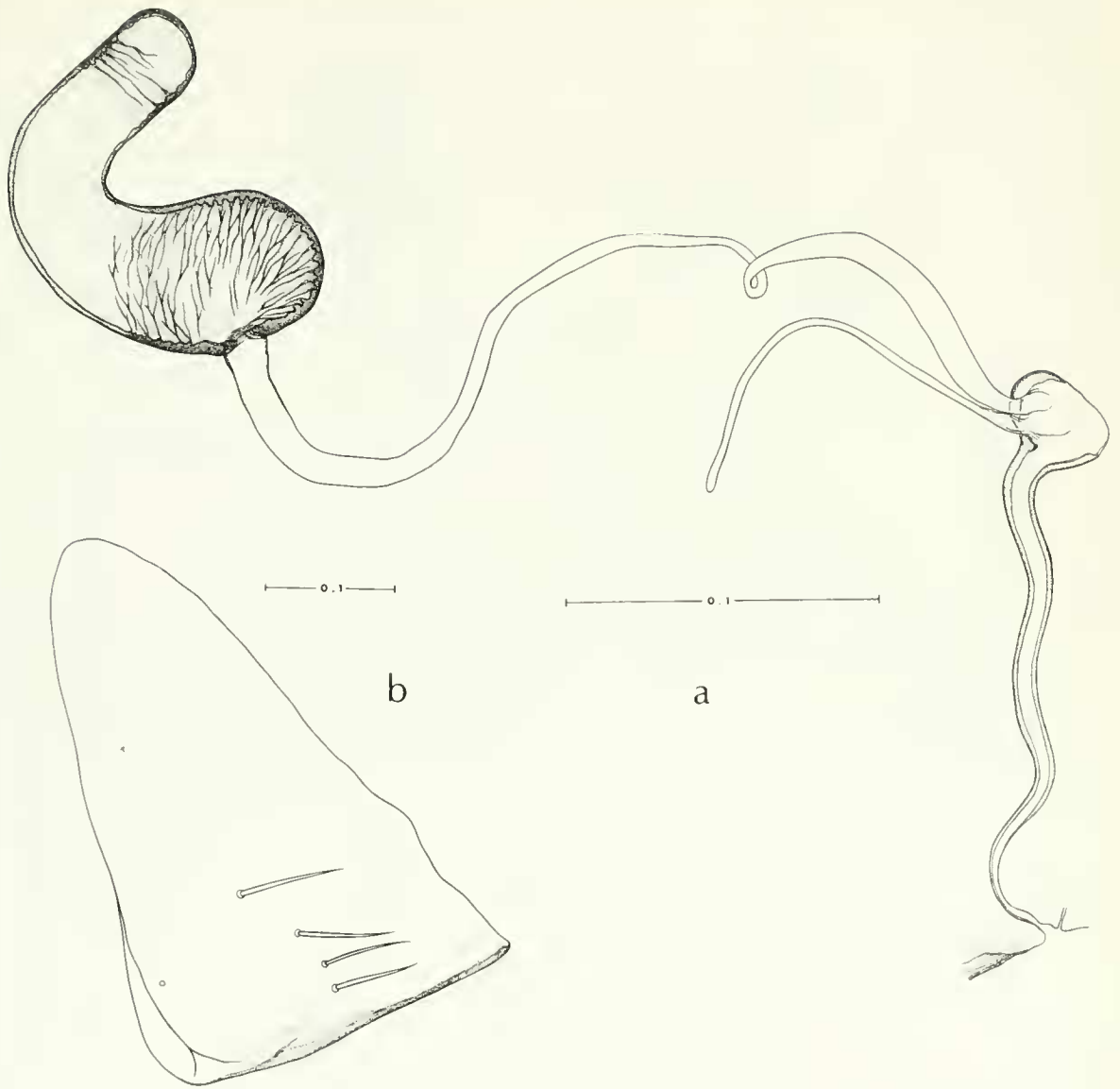


Fig. 82. *Rothschildopsylla noctilionis* (Costa Lima). Female: a, spermatheca, duct of spermatheca and bursa copulatrix. b, seventh sternum.

REMARKS

We have not compared our specimen with the male holotype but based on illustrations (Hopkins and Rothschild, 1956) it appears to be *R. noctilionis*. Since the female has not been collected heretofore, a brief description is given below.

DESCRIPTION

Female (Fig. 82). Seventh sternum with posterior margin straight except for slight undulations in ventral portion, row of 3 lateral setae with 1 larger seta above and cephalad of row. Spermatheca somewhat shape of boomerang; with no line of demarcation between bulga

and hilla; bulga reticulate with some reticulation at apex of hilla; perula of bursa with long, thin, blind duct.

Genus *Sternopsylla* Jordan and Rothschild
Sternopsylla Jordan and Rothschild, 1921b:158.

Type Species: *Ischnopsylla texanus* I. Fox.

Sternopsylla distincta speciosa Johnson
 (Fig. 83-86)

Sternopsylla distincta speciosa Johnson, 1957: 100, Pl. 48, Fig. 3, 4, Pl. 50, Fig. 3, 8.—
 Tipton and Mendez, 1966:307-308, Pl. 64, 65.

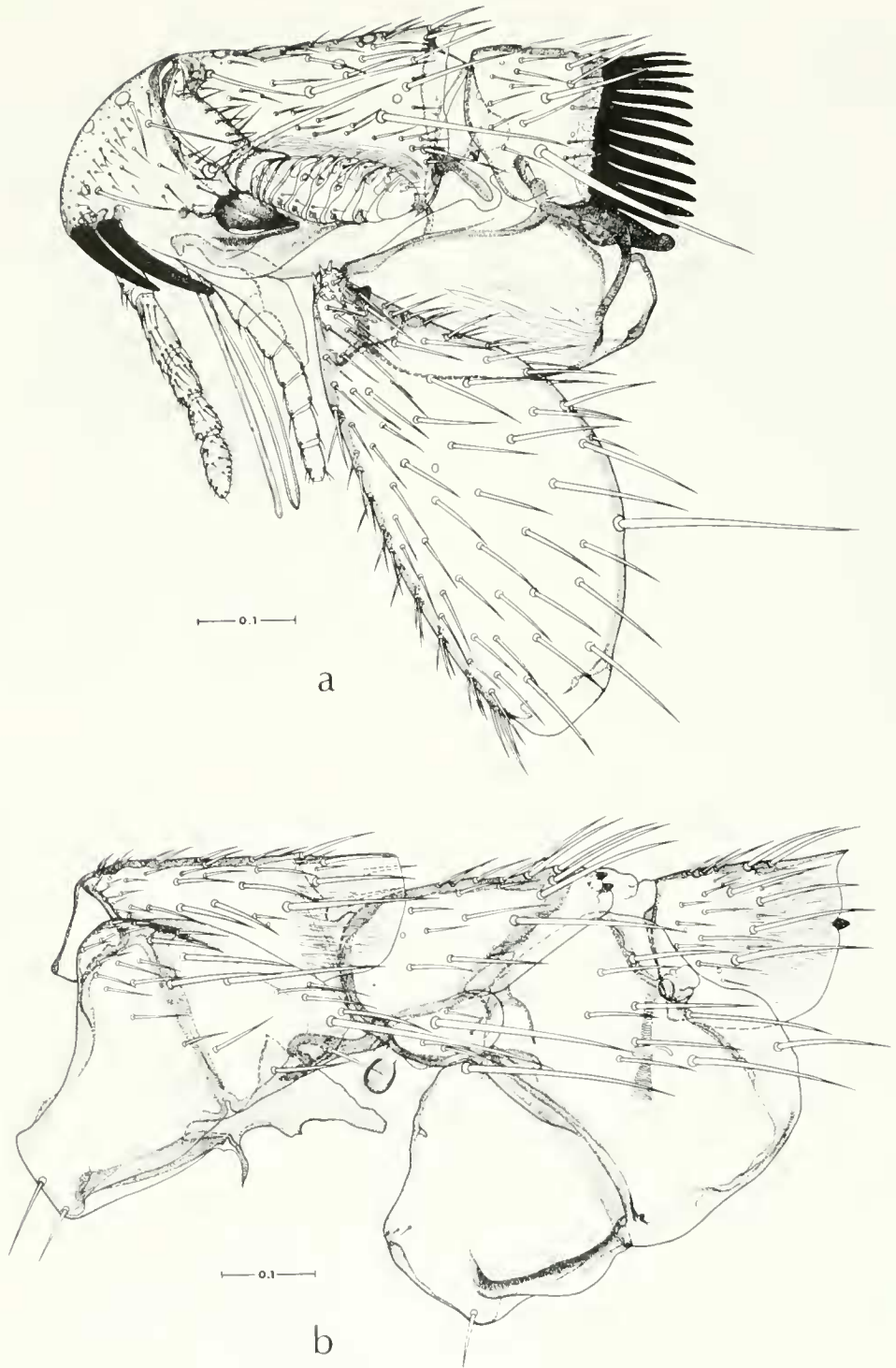


Fig. 83. *Sternopsylla distincta speciosa* Johnson. Male. a, head prothorax and procoxa. b, meso- and metathorax and first abdominal segment.

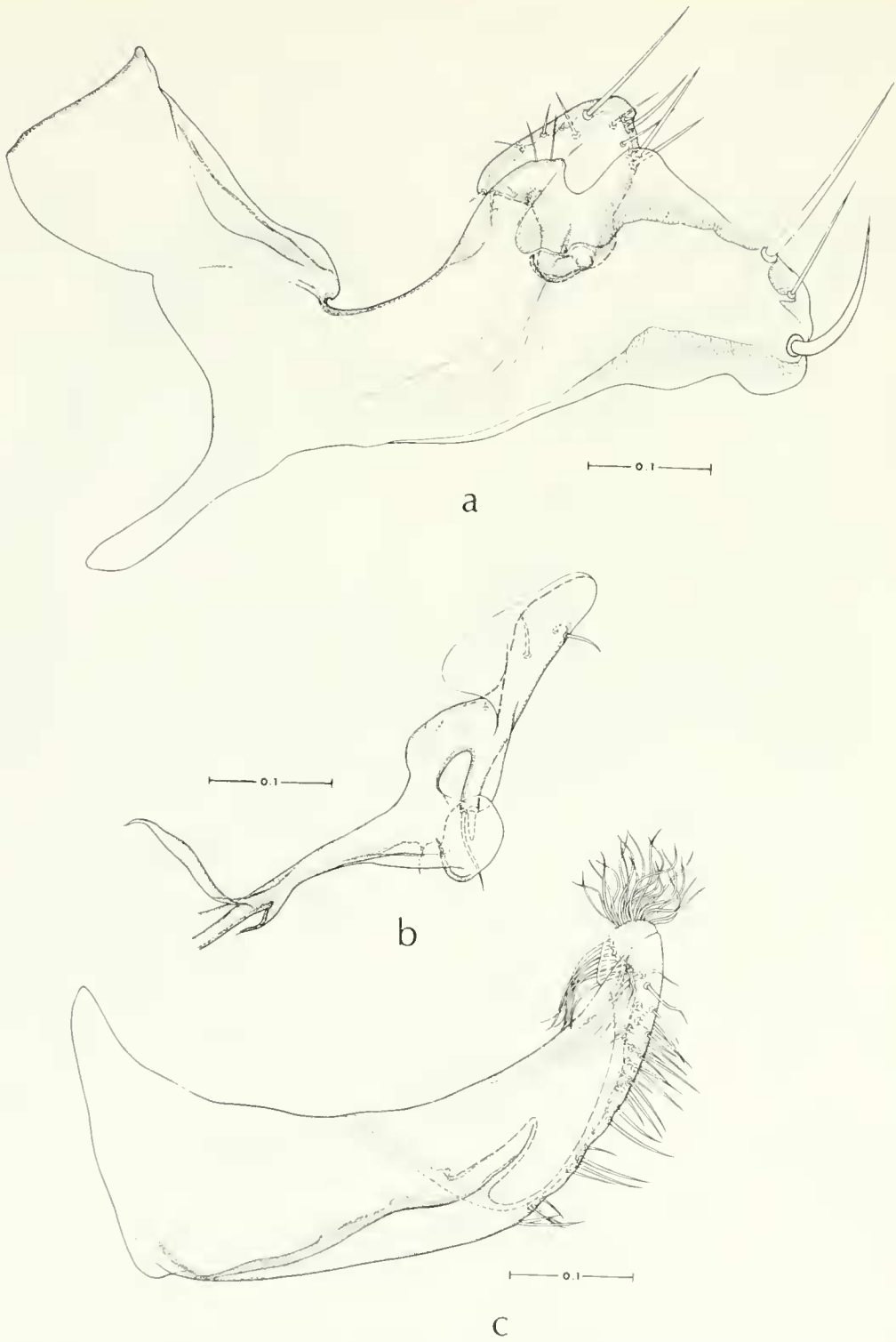


Fig. 84. *Sternopsylla distincta speciosa* Johnson, Male: a, process and movable finger of clasper. b ninth sternum. c, eighth sternum.

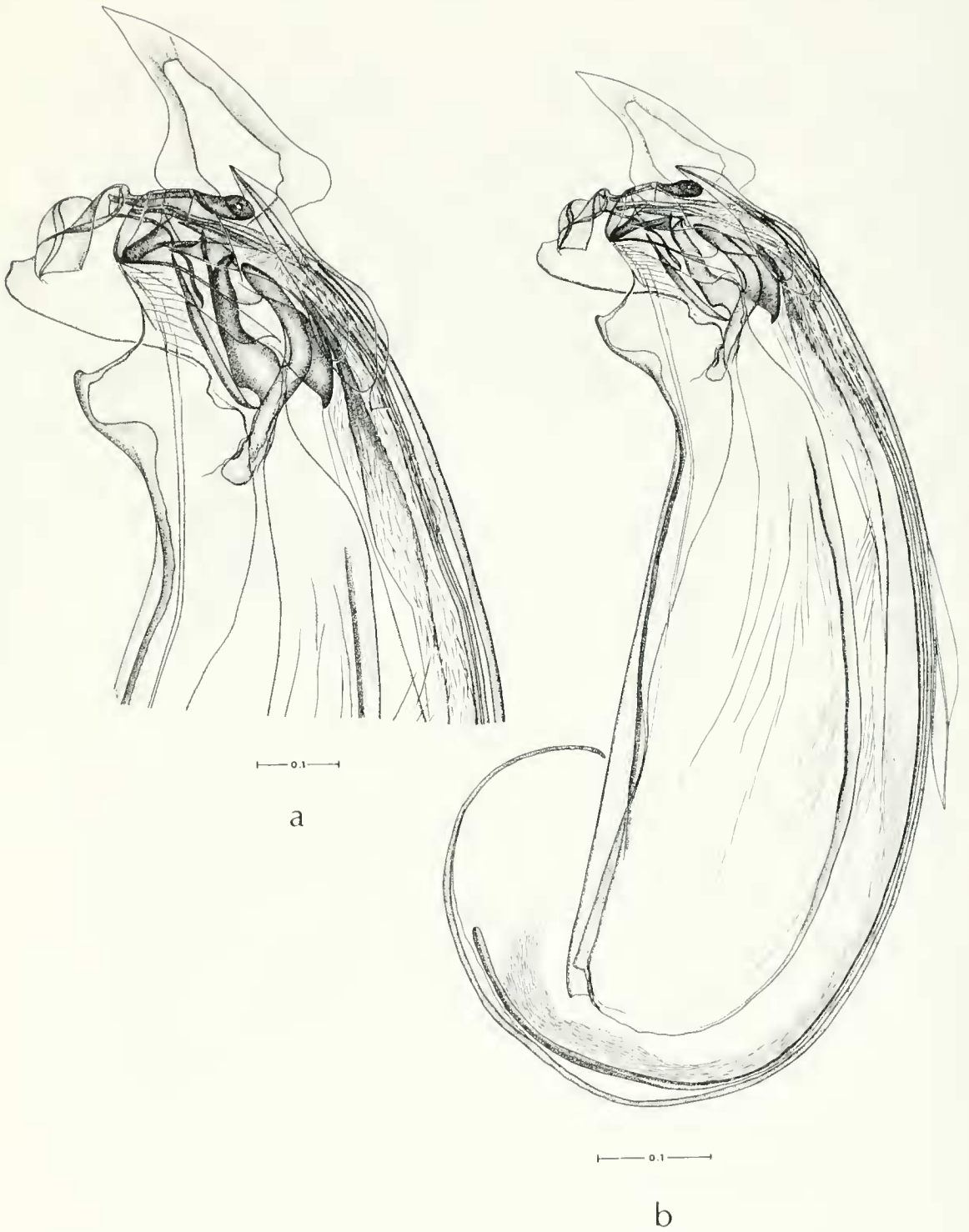


Fig. 85. *Sternopsylla distincta speciosa* Johnson. Male: a, apex of aedeagus, b, aedeagus.

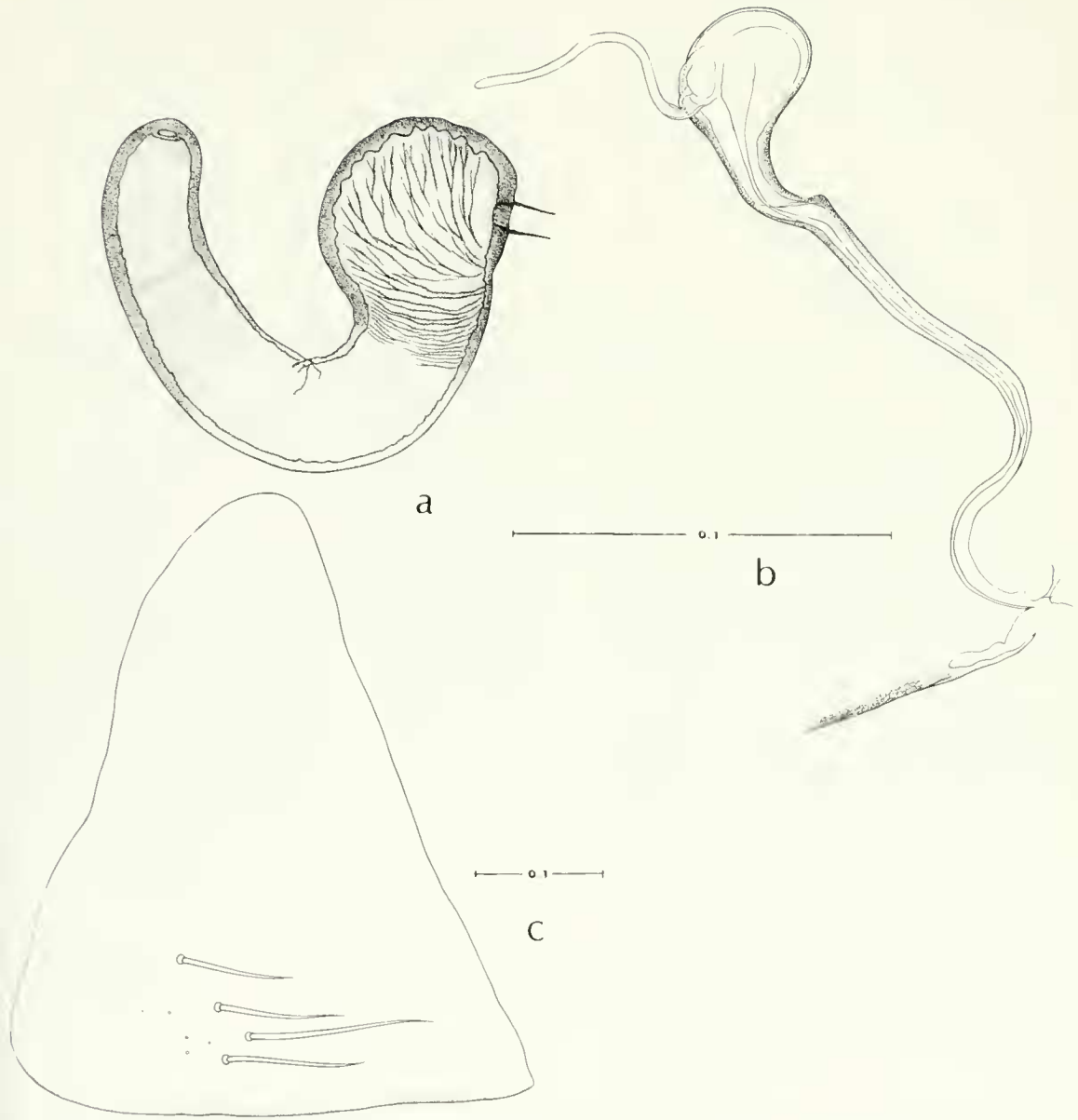


Fig. 86. *Sternopsylla distincta speciosa* Johnson. Female: a, spermatheca. b, bursa copulatrix. c seventh sternum.

Type Data: Male holotype, female allotype, 3 paratype females ex *Tadarida brasiliensis*, Peru: Dept. of Cuzco, Quince Mil, 19-VI-1950, C. Kalinowski collector. One male and 3 female paratypes ex *Tadarida* species, Colombia: Dept of Huila, Pitalico, 1350 m elev., 28-XI-1951, P. Hershkovitz collector.

Other Recorded Distribution: Panama: ex *Myotis nigricans nigricans*, *M. chiloensis*, *Tadarida brasiliensis*, and *Tadarida yucatanica*.

VENEZUELAN RECORDS (1 male and 1 female)

One male (SVP 4017) ex *Tadarida brasiliensis*, La Mucny, 4 mi. E Tabay, Mérida, 2107 m elev., 9-III-1966, Peterson team collector. One female (SVP 6912) ex *Tadarida gracilis*, 10 km NW Urama, Yaracuy, 25 m elev., 11-III-1966, Tuttle team collector.

REMARKS

The distal arm of the ninth sternum and apex of the aedeagus are similar to those illustrated by Tipton and Mendez (1966) for *S. d. speciosa*. Our male specimen from Venezuela differs from illustrations given by Tipton and

Mendez (1966) and Johnson (1957) in that the finger of the clasper is much broader apically. The eighth sternum is much wider in our specimen and the apical patch and the subapical row of pseudosetae are more pronounced. These differences in the eighth sternum may be due to the orientation of the specimen on the slide.

Family Ceratophyllidae

Genus *Dasypsyllus* Baker

Dasypsyllus Baker, 1905:129.

Type Species: *Ceratophyllus perpinnatus* Baker.

Dasypsyllus gallinulae perpinnatus (Baker)

Ceratophyllus perpinnatus Baker, 1904:386, 391, 445.

Dasypsyllus perpinnatus, Baker, 1905:129, 146.

Ceratophyllus gallinulae perpinnatus, Jordan, 1926:356.

Dasypsyllus gallinulae perpinnatus, Wagner, 1930:14.—Traub, 1950:104.—Tipton and Mendez, 1966:309, Pl. 67.

Type Data: Ex unknown host, Canada: Queen Charlotte Islands, J. K. Keen collector.

Other Recorded Distribution (South America): Argentina: ex nest of bird. Panama: ex *Sciurus granatensis chiriquensis*, *Zonotrichia capensis costaricensis*, and *Vireo leucophrys chiriquensis*. Venezuela: ex nest of *Xanthomus viridis*.

VENEZUELAN RECORDS (23 males and 13 females)

Most of the specimens (16 males and 11 females) were collected from unidentified birds in the state of Mérida between 2150 and 2640 meters elevation. In addition, there were 2 males ex *Thomasomys lugens* and 1 male ex *Sciurus granatensis* from the state of Mérida. Two males were collected from 2 unidentified birds in the state of Táchira at about 2400 meters elevation. One female ex *Rhipidomys venustus* and 1 male ex *Atlapetes brunneinucha* were collected near Caracas at about 2000 meters elevation. One female ex *Atlapetes schistaceus* and 1 male ex an unidentified bird were collected in the state of Trujillo at 2360 meters elevation.

All of our specimens were collected at elevations above 2000 meters.

Dasypsyllus lasius venezuelensis
(Fox and Anduze)

Ceratophyllus lasius Rothschild, 1909:63, Fig. 10.

Dasypsyllus lasius, Jordan, 1933:76.

Arcosopsylla venezuelensis I. Fox and Anduze, 1917:108, Pl. 1, Fig. 1-3.

Dasypsyllus lasius venezuelensis, Johnson, 1957: 117, Pl. 53, 54, 55.—Barrera and Diaz-Ungria, 1957:179-180.—Machado-Allison, 1963: 276.—1966:26.—Tipton and Mendez, 1966:310, Pl. 68, 69.

Type Data: Male holotype, female allotype, male and female paratypes ex swallow's nest; Venezuela, Mérida, Apartaderos, 3300 m elev., IX-1944, collector P. Anduze.

Other Recorded Distribution: Panama, Chiriquí, ex *Notiochelidon cyanoleuca*.

REMARKS

We did not collect *D. lasius venezuelensis* in Venezuela but had we obtained swallows' nests at high elevations it is likely that we would have encountered this species.

Dasypsyllus stejegeri (Jordan)

Ceratophyllus stejegeri Jordan, 1929:36-37, Pl. 2, Figs. 22, 23.—Costa Lima and Hathaway, 1946:319.

Dasypsyllus stejegeri, Holland, 1949:12.—Smit, 1961:66, 67.—Tipton and Mendez, 1968:191.

Type Data: Male lectotype (Smit, 1961) ex unknown host, Bering Island, Northern Pacific Ocean, 1882-1883.

Other Recorded Distribution: East Falkland: Stanley, ex *Turdus falklandii falklandii*, *Pezomites militaris falklandicus*, and *Passer domesticus*. Alaska: Homer, ex *Marmosa caligata*. Mexico: Cerro Potosi, (collected above 3200 meters) ex bird nest, man.

VENEZUELAN RECORDS (3 females)

One female (SVP 3950) ex *Didelphis azarae*, Timotes, Mérida, 3275 m elev., 9-II-66. One female (SVP 4260) ex "bird," La Coromoto, Mérida, 3170 m elev., 19-III-66. One female (SVP 4296) ex *Zonotrichia capensis*, La Coromoto, Mérida, 3170 m elev., 21-III-66.

REMARKS

D. stejegeri has been collected so rarely that it is difficult to comment about its distribution. We suspect that it is a common bird flea in Venezuela at high elevations. Our 3 specimens were collected above 3100 meters.

Genus *Orchopeas* Jordan

Orchopeas Jordan, 1933:71.

Type Species: *Pulex wickhami* Baker

Orchopeas howardi (Baker)

Pulex wickhami Baker, 1895:109, 111.

Pulex howardi Baker, 1895:110, 112.

Orchopeas wickhami, Jordan, 1933:71-72.

Orchopeas howardi, Ewing and Fox, 1943:33.—Costa Lima and Hathaway, 1946:259-260.—Traub, 1950:100, 101.—Eads, 1950:46-48, Fig. 1-10.—Barrera, 1955:90-93, Fig. 5-12.

Type Data: Type specimens ex red squirrel (= *Tamiasciurus hudsonicus?*), Ithaca, New York; ex squirrel, Tullula Falls, Georgia; ex gray or fox squirrel and field mouse nest, Lincoln, Nebraska; ex unknown host, Ames, Iowa.

Other Recorded Distribution: Eastern United States and Canada. It has been collected in several localities in the western United States where it may have been introduced with tree squirrels from the eastern states. Subspecies have been described from Texas and Mexico.

VENEZUELAN RECORDS (2 males)

Two males ex *Sciurus granatensis* (SVP 22010), Táchira, Buena Vista, 2350 meters elevation.

REMARKS

Our specimens are definitely not *O. howardi howardi* (Baker), *O. howardi texensis* Eads or *O. howardi bolivari* Barrera but probably represent an undescribed subspecies. We prefer not to describe this material until additional specimens are available. This is the first collection of a representative of the genus *Orchopeas* in South America.

Genus *Pleochaetis* Jordan

Pleochaetis Jordan, 1933:77-79.

Type Species: *Ceratophyllus mundus* Jordan and Rothschild.

Pleochaetis apollinaris (Jordan and Rothschild)
(Fig. 87, 91c)

Ceratophyllus apollinaris Jordan and Rothschild, 1921c:176, Fig. 163, 164.—Traub, 1950:36-37, Pl. 20, Fig. 8-13.—Johnson, 1954:289, 291, Fig. 5.—1957:120.

Type Data: Description based on 2 females ex *Mustela affinis* (= *M. frenata affinis*): Colombia: savannah of Bogota; Coll. Apollinaire-Marie, V-1917.

Other Recorded Distribution: Colombia, Río Balcones, Guasco, Dept. of Cundinamarca, 1 male and 3 females ex *Mustela frenata*.

VENEZUELAN RECORDS (3 males and 7 females)

All 10 specimens were collected in Táchira, 2 females ex *Thomasomys hylophilus* and 3 males and 5 females ex *Akodon bogotensis*.

REMARKS

Since the description of *P. apollinaris* was based on 2 female specimens and there has been only one subsequent collection of one male, it is difficult to adequately define this species. Our specimens conform to the description and illustrations given by Johnson (1954) in that the ventral-most of the four large bristles on the movable process of the clasper is inserted above the notch on the anterior margin of the movable process; the crochet is curved and fingerlike and there are two strong setae on the proximal lobe of the distal arm of the ninth sternum. Our specimens differ in that there is only one ventral bristle on the eighth tergum and in details of the aedeagus.

Pleochaetis dolens (Jordan and Rothschild)
(Fig. 88)

Ceratophyllus dolens Jordan and Rothschild, 1914:257, Fig. 1, 2.

Pleochaetis dolens, Jordan, 1933:77.

Type Data: Costa Rica ex *Sciurus hoffmanni* (= *S. granatensis hoffmanni*).

VENEZUELAN RECORDS (5 males and 14 females)

There were 3 males and 6 females ex 6 *Rhipidomys venustus* (Dto. Federal); 1 male and 2 females ex 1 *Rhipidomys venezuelae* (Dto. Federal); 1 male and 5 females ex 2 *Sciurus granatensis* (Dto. Federal and Mérida); 1 female ex *Rattus norvegicus* (Dto. Federal).

REMARKS

Our specimens are undoubtedly *Pleochaetis dolens* but differ somewhat from the nominate subspecies. There are 3 strong setae on the proximal lobe of the distal arm of the ninth sternum rather than 2; the setae on the male eighth sternum are stronger and more numerous and the crochet is more broadly truncate than indicated by Traub (1950) and Tipton and Mendez (1966) for *P. dolens dolens*. There are additional differences in details of the aedeagus.

Pleochaetis dolens quitanus (Jordan)
(Fig. 89)

Ceratophyllus dolens quitanus Jordan, 1931:136b, Fig. 2-4.

Trichopsylla (Pleochaetis) dolens quitanus, Costa Lima and Hathaway, 1946:306.—Machiavello, 1948:29.

Pleochaetis dolens quitanus, Jordan, 1950:605.—Traub, 1950:36, Pl. 20, Fig. 1-3.—Johnson, 1954:295.—1957:120-121, Pl. 57, Fig. 2, 4, 6.

Type Data: Male holotype plus 1 female ex *Oryzomys* sp. Ecuador, Cerro de Puntas,

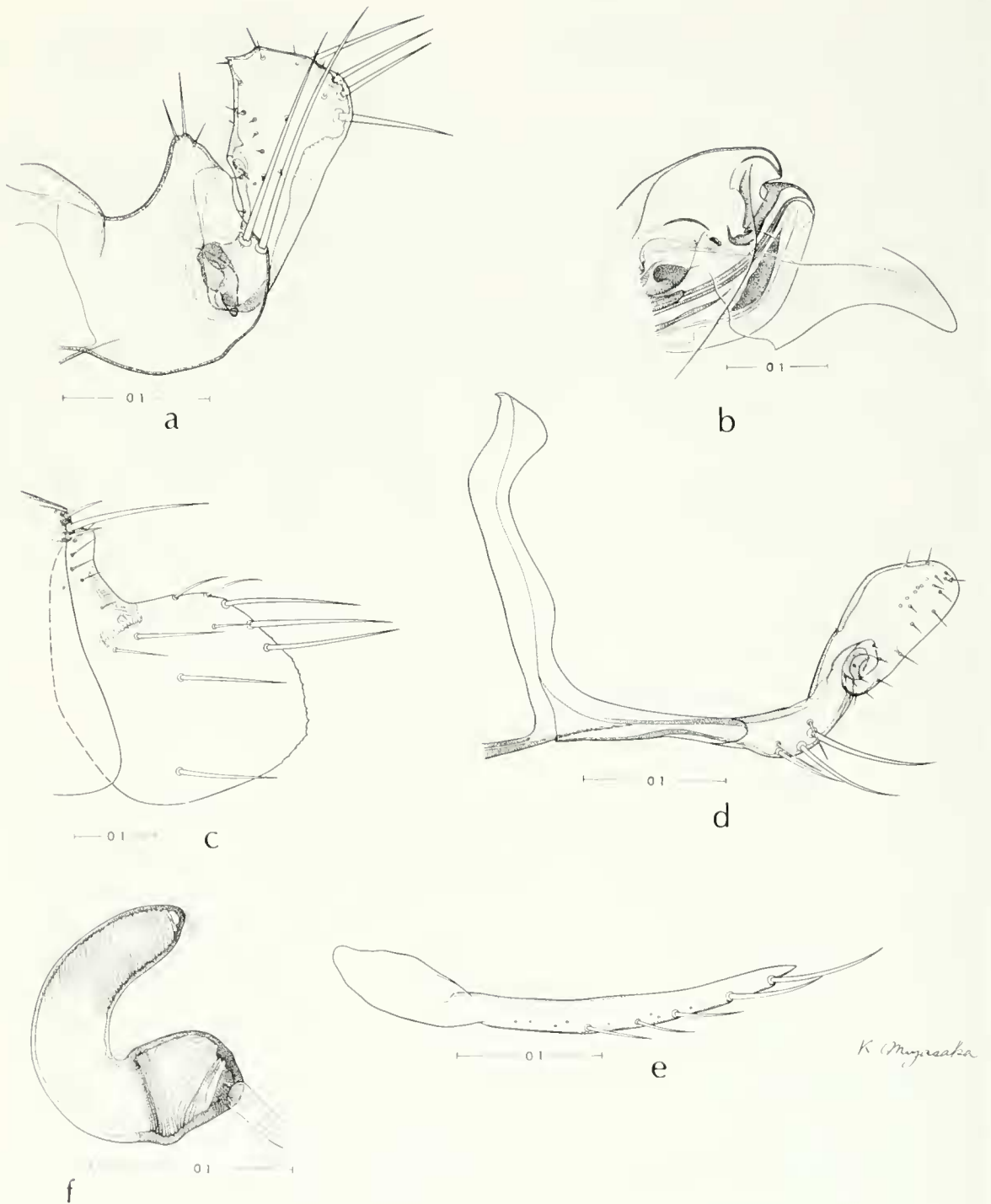


Fig. 87. *Pleochaetis apollinaris* (Jordan and Rothschild). Male: a, process and movable finger of clasper. b, apex of aedeagus. c, seventh and eighth abdominal terga. d, ninth sternum. e, eighth sternum. Female: f, spermatheca.

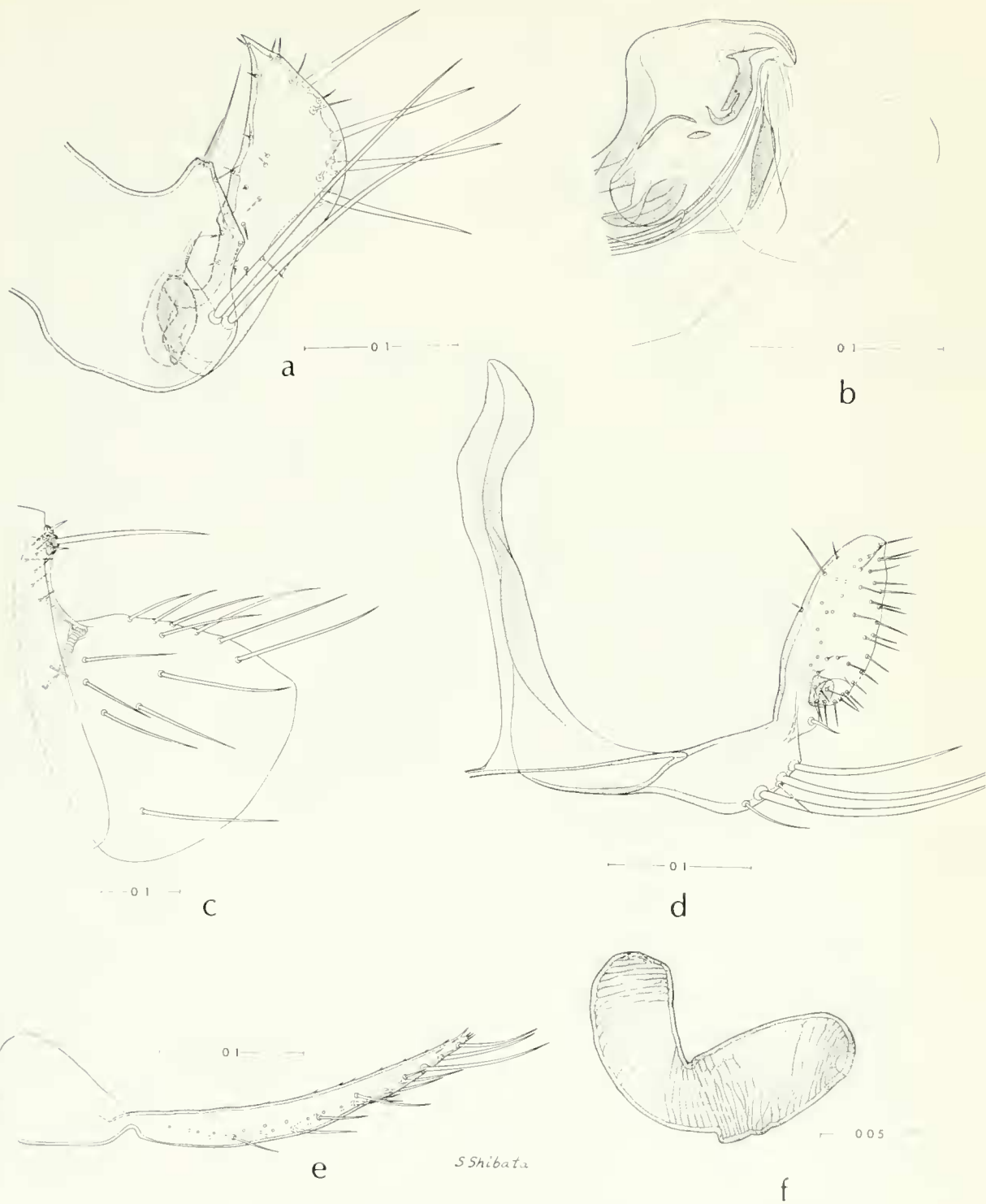


Fig. 88. *Plcochaetis dolens* (Jordan) ex *Rhipidomys venustus* (SVP 0780), Dto Federal. a, process and movable finger of clasper. b, apex of aedeagus. c, seventh and eighth abdominal terga. d, ninth sternum. e, eighth sternum. Female; f, spermatheca.

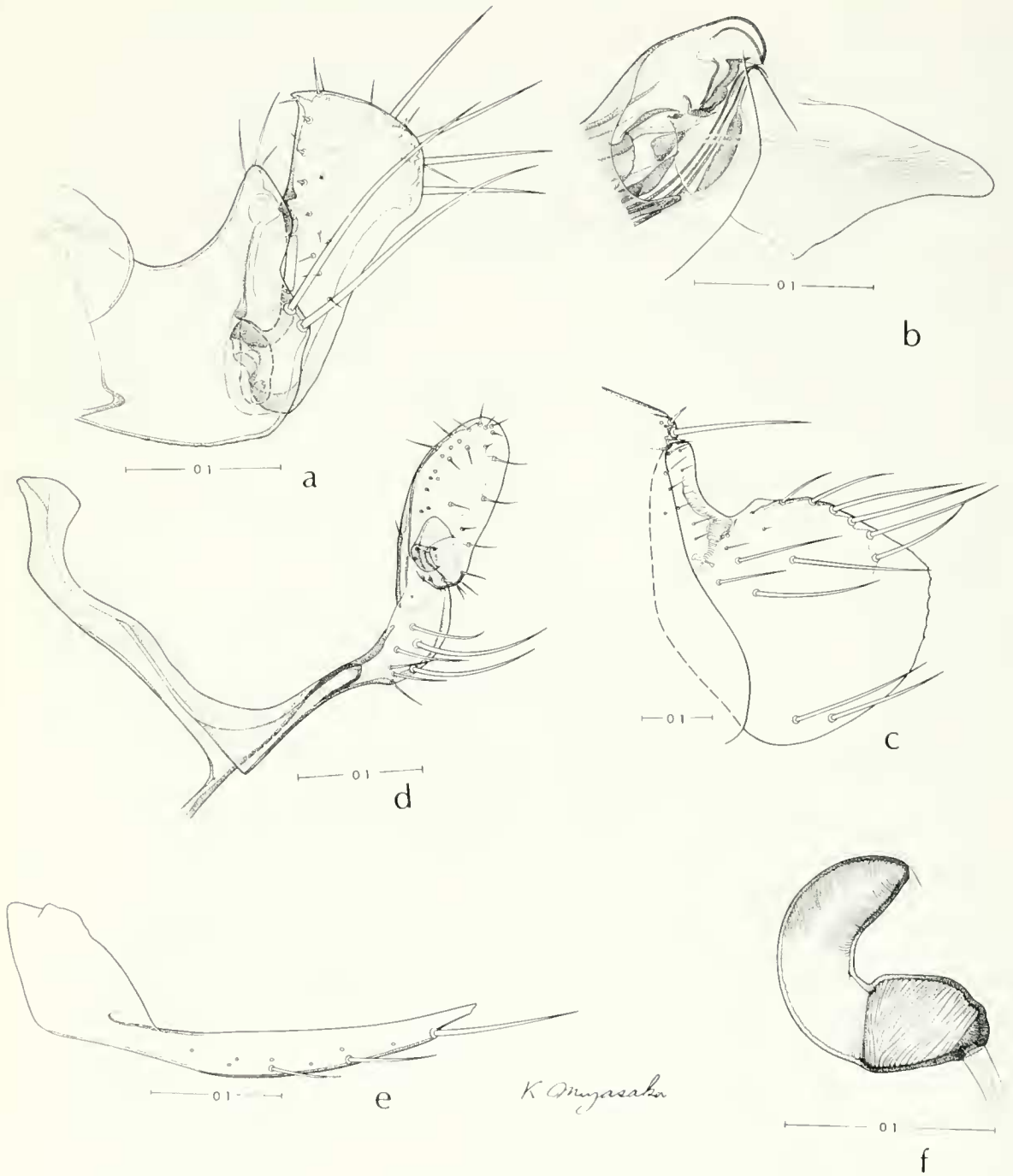


Fig. 89. *Pleochaetis dolens quitanus* (Jordan) ex *Rhipidomys venustus* (SVP 4264), Merida, La Coromoto. Male: a, process and movable finger of clasper. b, apex of aedeagus. c, seventh and eighth abdominal terga. d, ninth sternum. e, eighth sternum. Female: f, spermatheca.

Coll. F. Spillman. Two females as above except *Thomasomys* sp. One male ex *Thomasomys* sp. but Chimborazo. One male ex unknown host near Quito.

Other Recorded Distribution: Peru: ex nests of *Akodon mollis orophilus* and ex *Oligoryzomys longicaudatus stolzmanni* (= *Oryzomys longicaudatus stolzmanni*), *Akodon mollis*, "nest in field" and human bed.

VENEZUELAN RECORDS (122 males and 150 females). See Table 7.

REMARKS

In our series the females have no sinus in the caudal margin of the seventh sternum and the tail of the spermatheca near the bulga has no striations. The fourth bristle of the movable process of the clasper of the male is well above the level of the anterior notch. These characters are in agreement with those given by Johnson (1957) for *P. dolens quitanus*. However, several characters are not in agreement with her illustrations: the caudal margin of the movable process of the clasper is concave, not straight; the dorsocaudal margin of the immovable process of the clasper is sharply angular rather than slightly angular; the setae on the proximal lobe of the distal arm of the ninth sternum are in an irregular patch not in a marginal row. Assignment of our specimens to *P. dolens quitanus* is provisional. Further study is required to determine the degree of variation and to establish the relationship between *P. dolens quitanus* and *P. equatoris*.

All specimens were collected near Mérida between 3,048 and 3,658 meters elevation. Nearly 41% of the specimens were collected from *Oryzomys minutus*. Most of the specimens of *P. smiti* were collected from this host at the same elevation and in the same collecting area.

Pleochaetis smiti Johnson
(Fig. 90, 91g)

Pleochaetis smiti Johnson, 1954:291-295. Fig. 1, 3, 6, 7, 8, 10, 12, 13, 16, 21, 23, 25, 26, 31.—1957:121.

Type Data: Male holotype ex *Thomasomys laniger*; Colombia: Dept. of Antioquia, Paramo. Coll. P. Hershkovitz, 13-X-1950. Female allotype same data except 12-X-1950. Female paratype ex *Oryzomys* sp. Ecuador, Region Oriental, Paramo de Guankuni, 27-VII-1931, Coll. F. Spillman.

Other Recorded Distribution: None.

VENEZUELAN RECORDS (203 males and 208 females). See Table 8.

REMARKS

The description of *Pleochaetis smiti* Johnson (1954) was based on 1 male and 2 females from Colombia. Our collections are from three areas in Venezuela (180 males and 197 females from Mérida, 16 males and 8 females from Táchira, and 8 males and 3 females from Trujillo). Specimens from Táchira fit rather well the description and illustrations given by Johnson. In all of the female specimens from Venezuela the caudal margin of the seventh sternum is remarkably like illustrations given by Johnson. However, the juncture of the head and tail of the spermatheca is more pronounced in many of the Venezuelan specimens. In the Venezuelan specimens there are 24 teeth in the pronotal comb (23-26 in type specimens), 5 or 6 dorsal notches on the metatibia (7 in type specimens), no long setae on the proximal lobe of the distal arm of the ninth sternum (DA9) (none in type specimens), the distal lobe of DA9 is swollen (sides parallel in type specimens), the apex of the sclerotized inner tube is rounded (sharply pointed in type specimens) and the caudoventral margin of the crochet is deeply concave (slightly concave in type specimens). The caudal margin of the movable pro-

Table 7. Venezuelan Records of *Pleochaetis dolens quitanus* (Jordan).

Host	Number of host specimens	Fleas		Index
		Males	Females	
<i>Oryzomys minutus</i>	84	64	76	1.66
<i>Thomasomys laniger</i>	36	36	54	2.50
<i>Akodon bogotensis</i>	11	12	9	1.91
<i>Cryptotis thomasi</i>	3	6	7	4.33
Found in camp	0	1	1	
<i>Didelphis azarac</i>	1	0	1	
<i>Rhipidomys</i> sp.	1	3	1	

Table 8. Venezuelan Records of *Pleochaetis smiti* Johnson.

Host	Number of host specimens	Fleas		Index
		Males	Females	
Mérida: 1980-3785 meters elev.				
<i>Oryzomys minutus</i>	138	162	173	2.42
<i>Thomasomys laniger</i>	21	13	20	1.52
<i>Didelphis azarac</i>	1	2	2	
<i>Cryptotis thomasi</i>	1	1	1	
<i>Rhipidomys venustus</i>	1	1	0	
Bird	1	1	0	
Found in camp	0	0	1	
Trujillo: 2225-2360 meters elev.				
<i>Oryzomys minutus</i>	9	8	3	1.11
Táchira: 2288-2418 meters elev.				
<i>Oryzomys minutus</i>	11	12	6	1.63
<i>Thomasomys hylophilus</i>	6	4	2	1.00

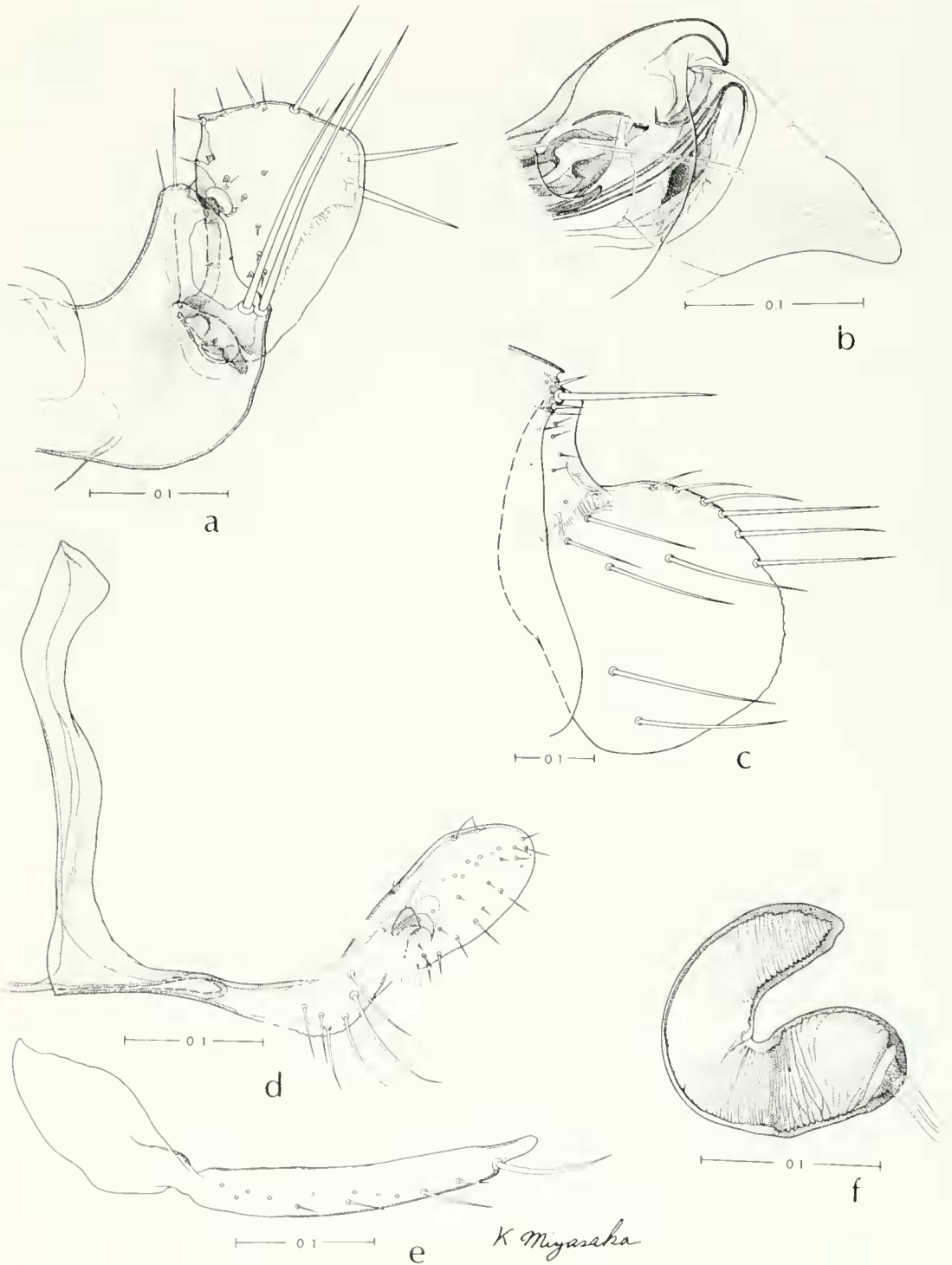


Fig. 90. *Plecochactis smiti* Johnson ex *Oryzomys minutus* (SVP 04067), Merida-La Coromoto. Male: a, process and movable finger of clasper. b, apex of aedeagus. c, seventh and eighth abdominal terga. d, ninth sternum. e, eighth sternum. Female: f, spermatheca.

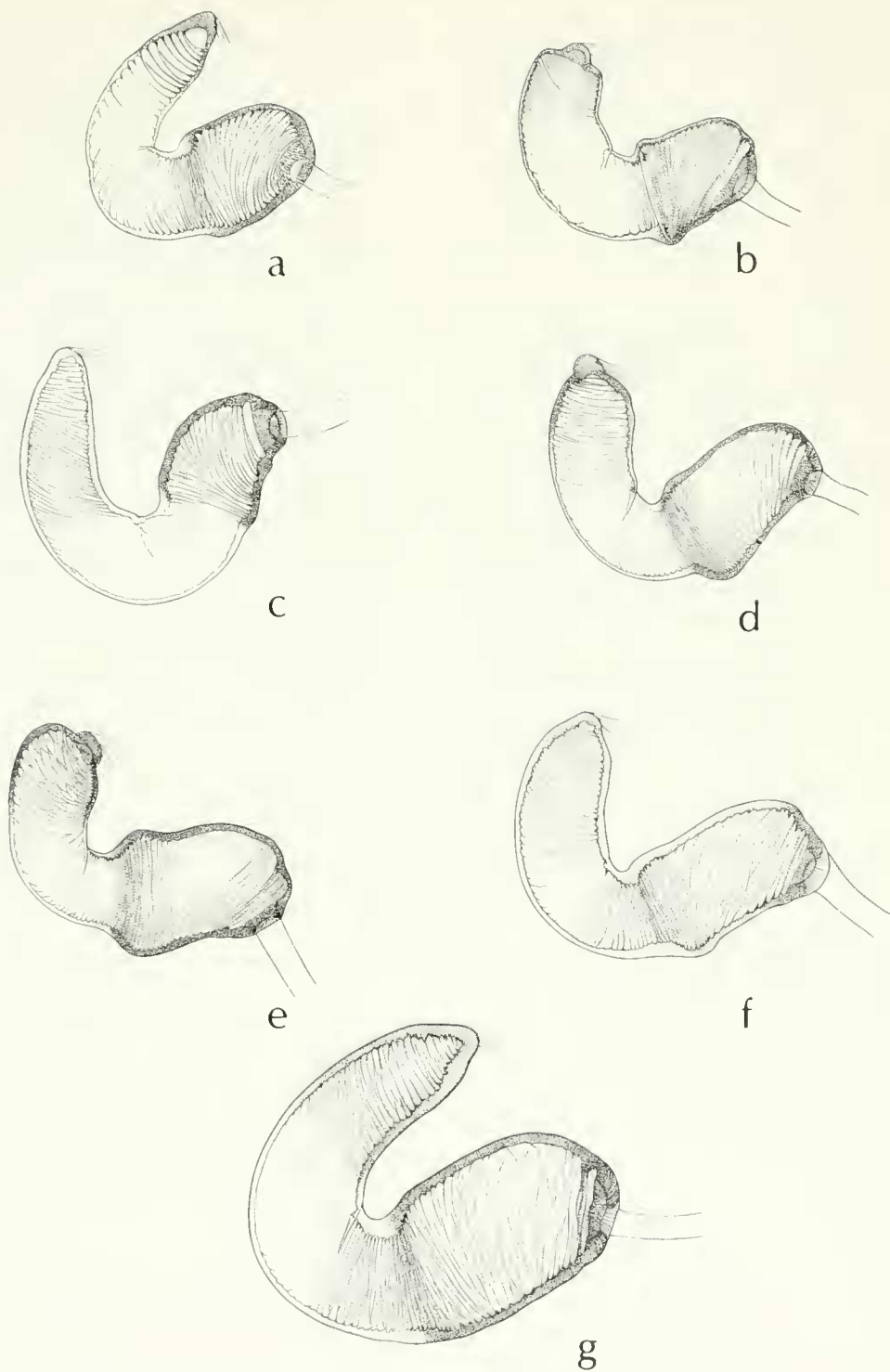


Fig. 91. Spermathecae of *Plochactis* species: a, *P. asctus* (ex *Microtus mexicanus subsimus*, Cerro Potosi, Mexico). b, *P. aztecus* (ex *Peromyscus melanotis*, Cerro Potosi, Mexico). c, *P. appolinaris* (ex *Akodon bogotensis*, SVP 21901, Venezuela). d, *P. dolens* (ex *Sciurus granatensis chiriquensis*, Panama). e, *P. mathesonii* (ex *Reithrodontomys c. chrysopsis*, Mexico). f, *P. sibynus* (ex *Peromyscus difficilis*, Cerro Potosi, Mexico). g, *P. smiti* (ex *Oryzomys minutus*, SVP 4067, Venezuela).

cess of the clasper is deeply concave in the type specimens and also in the Táchira specimens but in the Trujillo and Mérida specimens the caudal margin is straight.

Each of the three populations from Venezuela may represent a subspecies of *P. smiti*. However, until more specimens are collected from the type locality to determine the degree of variation we prefer to call all of our specimens *P. smiti*.

Approximately 85% of the specimens from Mérida were collected from *Oryzomys minutus*. Essentially all of the specimens were collected above 2286 meters elevation and 96.4% were collected above 3,048 meters elevation.

Notes on the genus *Pleochaetis*

The genus *Pleochaetis* is a large and complex genus. The need for a revision is apparent. Johnson (1954) commented on the confusion surrounding the relationship between *P. equatoris equatoris* and *P. apollinaris* and there are similar problems related to other species groups. A thorough study of long series from type localities will be required to resolve these problems. Figure 91 shows spermathecae of seven species of *Pleochaetis* collected from four widely separated geographic areas. Each spermatheca is distinctive but collections in intermediate areas reveal intergradations.

P. smiti and *P. dolens quitanus* parasitize the same host (*Oryzomys minutus*) at the same elevation (3048 to 3810 meters). It would be illuminating to ascertain experimentally the rigidity of the reproductive isolating mechanisms between these two species and the extent that one species may exert an influence on the gene pool of the other. Extreme variation in the Mérida populations of *P. smiti* may be due to competitive pressure or introgression.

Family Leptopsyllidae

Genus *Leptopsylla* Jordan and Rothschild

Leptopsylla Jordan and Rothschild, 1911:85.

Type Species: *Pulex musculi* Duges, 1832 (= *Pulex segnis* Schönherr, 1811).

Leptopsylla segnis (Schönherr)

Pulex segnis Schönherr, 1811:98.

Leptopsylla musculi, Jordan and Rothschild, 1911:85.

Leptopsylla segnis, Dalla Torre, 1924:2.—Ewing and Fox, 1943:93, Fig. 8G.—Anduze, Vogelsang, and Pilano, 1947:4. — Macchiavello, 1948:24-26. — Traub, 1950:105, Pl. 51, Fig. 1.—Johnson, 1957:113, 114, Pl. 51, 52.—Barrera and Diaz-Ungria, 1957:164, 175-176.—Cova Garcia and Tallaferro, 1959: 328, 331, 336.—Machado-Allison, 1966:22, 24, 28.

Type Data: Ex *Mus musculus*, Sweden.

Other Recorded Distribution: Argentina, Brazil, Chile, Ecuador, Peru; ex species of the following genera: *Akodon*, *Mus*, *Rattus*, and *Cavia*.

VENEZUELAN RECORDS (25 males and 31 females)

There were 15 males and 26 females ex 20 *Mus musculus* (from Dto. Federal, Trujillo, and Mérida). In addition there were: 8 males and 4 females ex 4 *Rattus norvegicus* (Dto. Federal and Mérida), 2 males and 2 females ex 2 *Oryzomys albigularis* (Dto. Federal), and 2 *Oryzomys minutus* (Mérida).

REMARKS

More than 71% of our specimens were collected from *Mus musculus* and approximately 93% from *Mus musculus* plus *Rattus rattus*. All of our specimens were collected at elevations above 1770 meters and 60% of the specimens came from elevations in excess of 2743 meters. We suspect that *L. segnis* has become an established component of the South American fauna, particularly at high elevations.

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